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Girolando Breed Genetic Improvement Program Sire Summary Progeny Test Results July/2014



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GIROLANDO

Embrapa

*Brazilian Agricultural Research Corporation
Embrapa Dairy Cattle
Ministry of Agriculture, Livestock and Food Supply*

Documents 171

Girolando Breed Genetic Improvement Program Sire Summary Progeny Test Results - July/2014

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Presentation

The successful history of Girolando, which was initialized with the first official registration of the breed in 1996 by the Ministry of Agriculture, is outlined along with its development, and have been strongly supported by genetic improvement initiatives held by the Girolando Breeders Association and Embrapa Dairy Cattle. Those initiatives include the progeny test, established in 1997, and the Girolando Breed Genetic Improvement Program, established in 2007.

The partnership between Girolando Breeders Association and Embrapa Dairy Cattle, held in order to produce and release this summary in behalf of the Girolando breed, involves efforts of a staff composed of approximately one hundred people, working in several fields of animal production and science. Their work encompasses from registering field data, prospecting, organizing and managing partner herds, by the Girolando association; until treating, storing and analyzing data, as well as designing and publishing this present document. Hence, as a result of this work, the Girolando Sire Summary and Progeny Test Results contain a synthesis of several information that are greatly valuable for producers as well as for the community that shares interest in the Girolando breed.

The current year Sire Summary/ Progeny Test Results document is in its ninth edition. Each new edition contains innovative tools and resources for professionals and/or producers, such as information regarding molecular markers, the Girolando Linear Evaluation System (SALG) and the genetic evaluation of age at first calving.

Still, in order to convert this work into effective benefit for the Girolando breed, it is important that producers and people working in the field apply, more and more, those results as a primary source of information to support managerial decisions for improvement of their herds.

Paulo do Carmo Martins
General Manager
Embrapa Dairy Cattle

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1. Introduction

The Girolando breed progeny test was established in 1997, as a result of the partnership between Girolando and Embrapa Dairy Cattle. In 2007, the *Programa de Melhoramento Genético da Raça Girolando* – PMGG (Genetic Improvement Program of the Girolando Breed) was implemented. Besides interacting with previously existing initiatives of the Girolando Breeders Association, such as the genealogical register service, the progeny test and the dairy control service, the PMGG launched the Linear Evaluation System (SLAG). The main objectives of the PMGG comprises identification of genetically superior individuals, the technically-oriented multiplication of genetics, the evaluation of economic traits and the promotion of sustainable dairy activities.

The program have yielded impressive results. The Girolando breed semen sales increases faster than any other breed in Brazil. In 2013, over 544,000 semen doses were commercialized, implying an increment of 33.05% in comparison to 2012. It should also be stressed the remarkable increase in milk production of primiparous cows: in 2000 the production in 356 days was 3,657 Kg, while in 2013 it increased 19.4%, reaching a value of 4,534 kg.

As a consequence of those and other factors, Girolando is achieving more recognition, nationally and internationally, and therefore, is being considered the preferable dairy breed in tropical regions. Because Girolando animals are capable to sustain an acceptable production level when raised in diverse types of management systems and environmental conditions, the breed is widely accepted in Brazilian dairy systems. In fact, 80% of the milk produced in the country originates from Girolando cows.

2. History of the Breed

The first activities involving crossbreeding between Holstein and Gyr in Brazil emerged in the 40's. According to some older traditional dairy farmers, this crossing occurred mistakenly when a Gyr bull invaded a neighboring farm and mated Holstein cows. Nonetheless, the directed crosses were guided in order to generate offspring that would combine the high milk production capacity of the Holstein cattle and the rusticity of the Gyr breed. The crossbreds were noteworthy for excellent productivity, high fertility indexes and good vigor. Due to these advantages, the crossbreeding practice quickly spread around the entire country. Within a short period, Girolando became the predominant cattle breed on the majority of Brazilian dairy farms.

Over the years, dairy crossbred achieved great importance, and lead many research and rural extension institutions to study and apply the crossbred practice, with the

objective of improving the quality of the products. Thus, in 1978, the *Programa de Cruzamento Dirigido* – Procrúza (Directed Crossbreeding Program) was created in order to select different dairy and beef cattle crossbreeds. Under the leadership of the *Associação Brasileira de Criadores* – ABC (Brazilian Association of Breeders), the *Criadores de Gado de Leite do Triângulo Mineiro e Alto Paranaíba* – Assoleite (Triângulo Mineiro and Alto Paranaíba Association of Dairy Cattle Breeders) was in charge of implementing Procrúza. In 1988, the Ministry of Agriculture determined the end of Procrúza, and in 1989 Assoleite was registered under the Ministry and began managing the program for the formation of the Girolando breed. The association was since there named as *Associação Nacional dos Criadores de Girolando* (National Association of Girolando Breeders). In 1996, the Girolando breed became official, the entity took on the name *Associação Brasileira dos Criadores de Girolando* – Girolando (Brazilian Association of Girolando Breeders), headquartered in Uberaba, Minas Gerais State, Brazil.

3. The Girolando Breed

The Girolando breed was conceived aiming the development an ethnic group that produces milk sustainably, in tropical and subtropical regions. The breed's background is the crossing of Holstein (HOL) and Gyr (G) breeds, ranging genetic compositions varying from $1/4 \text{ HOL} + 3/4 \text{ G}$ to $7/8 \text{ HOL} + 1/8 \text{ G}$. However, matings are been directed in order to establish the breed's genetic composition at $5/8 \text{ HOL} + 3/8 \text{ G}$. The ultimate goal is to generate productive and standardized cattle, that meet the needs of dairy farmers. Animals resulting from mating between $5/8 \text{ HOL} + 3/8 \text{ Gyr}$ individuals are considered as Pure Synthetics (PS), which means the proper Girolando breed. In other to be registered as a definitive PS, besides being a product of such mate, an animal must have a positive genetic evaluation for the milk yield (PTA milk). This evaluation is based on an individual's own performance or on the performance of its parents. Other requirements are also demanded according to regulations from the Girolando Breed Genealogical Register, available on the Girolando site (www.girolando.com.br). The leading matings and crossbreeds practiced within the Girolando Program are presented below (Figure 1).

		MOTHER							
		Hostein	7/8	3/4	5/8 or PS	1/2	3/8	1/4	Gir
FATHER	Hostein	x	x	7/8 (87,5%)	x	3/4 (75%)	F ≈ 5/8 (68,75%)	5/8 (62,5%)	1/2 (50%)
	3/4	7/8 (87,5%)	13/16 (81,25%)	3/4 (75%)	x	5/8 (62,5%)	F ≈ 5/8 (56,25%)	1/2 (50%)	3/8 (37,5%)
	5/8 or PS	13/16 (81,25%)	3/4 (75%)	F ≈ 5/8 (68,75%)	PS (62,5%)	F ≈ 5/8 (56,25%)	1/2 (50%)	7/16 (43,75%)	5/16 (31,25%)
	Gir	1/2 (50%)	7/16 (43,75%)	3/8 (37,5%)	x	1/4 (25%)	x	x	x

Prepared by: Brazilian Association of Girolando Breeders, 2011.

Figure 1. Girolando breed crossbreed table.

In Figure 1 the fraction or percentage of Holstein breed composition is always read first. The genetic composition of the sire always comes before the dam. For the purpose of the register, only $5/8$ or PS cows can be bred with $5/8$ or PS bulls. Females with genetic composition between $F \approx 5/8$ will be controlled as $5/8$. Males of $F \approx 5/8$ will not have their genetic composition rounded off to $5/8$, maintaining the correct fraction according to the mating from which it arose. The cells marked with the X are products from crossbreeds of which Girolando does not turn official the genealogy.

The diagrams presented in Figures 2, 3, 4 and 5 show the leading strategies for the formation of Pure Synthetic (PS) Girolando. However, any combination between the breeds, Holstein, Gyr and its crossbreeds can be used for obtaining PS.

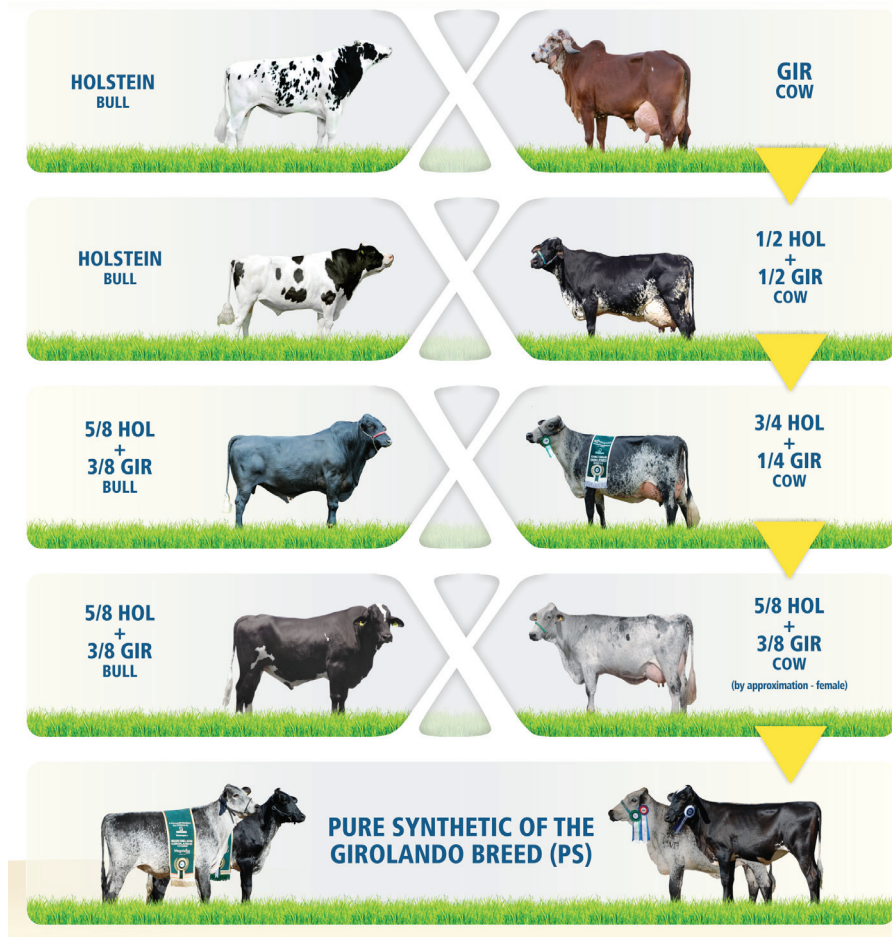


Figure 2. Crossbreed strategies for obtaining PS animals using Holstein breed bulls in the first two generations and a 5/8 Girolando bull in the following generations.

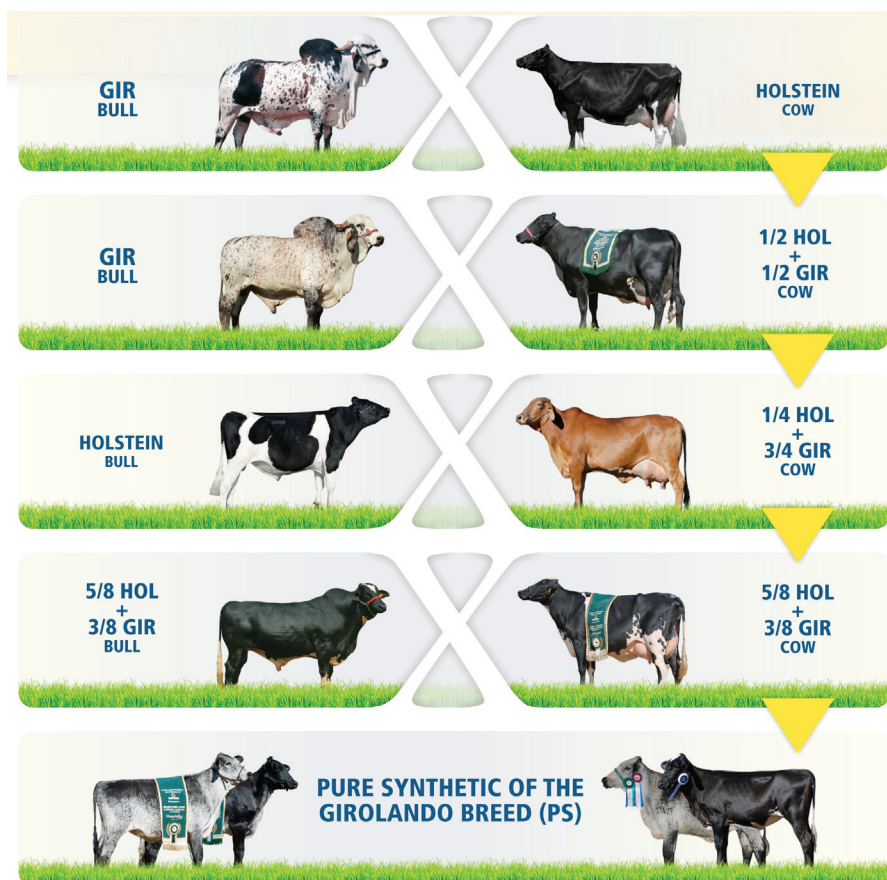


Figure 3. Crossbreed strategy for obtaining PS animals, using Gir and Holstein breed bulls in the first three generations and a 5/8 Girolando bull in the last generation.



Figure 4. Crossbreed strategy for obtaining PS animals, using Holstein breed bulls in the first generation, a 3/4 Girolando in the second generation and a 5/8 Girolando bull in the third generation.



Figure 5. Crossbreed strategy for obtaining PS animals, using a Gir bull in the first generation and a 5/8 Girolando bull in the last two generations.

Due to the greater availability of semen from Girolando bulls, the crossbreeding strategy using Girolando semen has become more viable. The main crossbreeding strategies using 5/8 of PS bulls are presented in Figure 6, and using 3/4 bulls are presented in Figure 7.

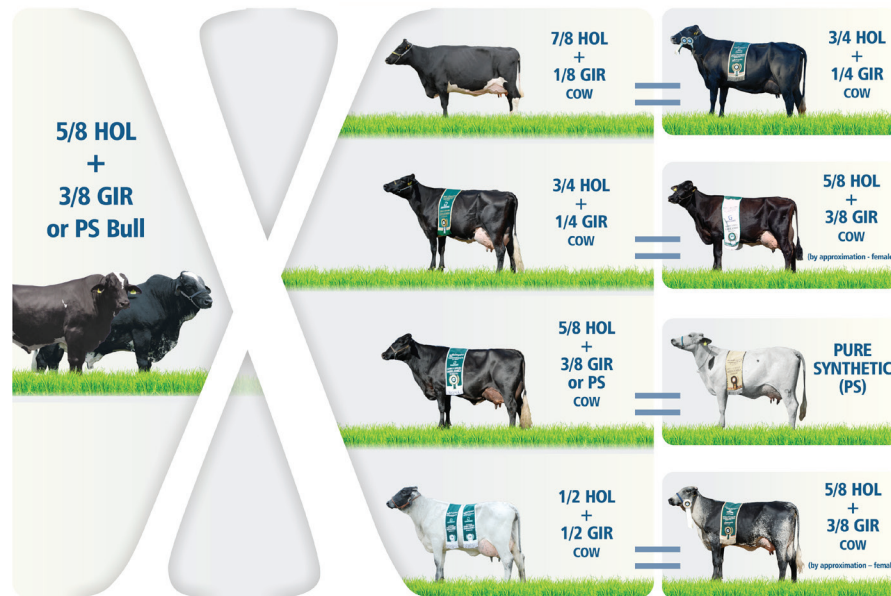


Figure 6. Most commonly used crossbreeds with Girolando 5/8 or PS bulls.



Figure 7. Most commonly used crossbreeds with Girolando 3/4 bulls.

4. Genotyping of Progeny Test Bulls

The evolution and recent advances achieved in the field of biotechnology allowed the use of molecular markers information for selection and mating programs. The knowledge about animal genotypes is of strategic importance and elevated economic value, as it allows for the identification of animals with greater potential for milk production, fat and protein milk content. Also this knowledge permits the identification of alleles linked to genetic diseases. With this information at hand, farmers can direct mating, choose semen, and therefore, apply the assisted selection through molecular markers for genetic improvement of Girolando breed.

4.1. Molecular Markers

Kappa-casein (k-CN) – The properties and quality of dairy are directly influenced by the its protein content. The main proteins in milk are caseins, lactoglobulins and albumins. Molecular studies have identified that variants of Kappa-casein are strongly associated to a greater yield for cheese production. The BB-genotype animals produce more milk protein when compared to AA-genotype animals. The BB genotype is associated to superior cheese processing traits, such as less coagulation time and the formation of a denser coagulate. The production of BB animals are associated with yield 12% greater in terms of mozzarella and 8% for cheddar cheese in comparison to AA-genotype animals. AB animals have an intermediary yield comparing to BB and AA genotypes.

β -lactoglobulin (β -LGB) – This gene encodes a milk protein which corresponds to 50 to 55% of the proteins contained in whey. Twelve alleles have been identified for this gene, and A and B alleles are the most frequent in commercial herds. Allele A is the most favorable for milk production, while allele B is related to a larger percentage of fat and

protein in milk. The milk from the animals with the AA genotype is recommended for *in natura* sale and milk from animals with the BB genotype is most recommended for the production of dairy, such as cheese.

DGAT1 – The DGAT1 (diacylglycerol O-acyltransferase 1) gene is strongly associated to the percentage of fat in the milk. Two alleles of this gene were identified in bovines. The A allele, fixed in the majority of Zebu breeds, is associated to increased protein and milk production. The K allele, very common in European breeds, is associated with a reduction in protein production and an increase in the production of fat in milk.

BLAD – Bovine leukocyte adhesion deficiency (BLAD) is a genetic disorder common in Holstein breeds. This disease is caused by a recessive mutation of the CD18 gene. Animals which are homozygote for this mutation have retarded growth, tooth loss, immune system failure and premature death, generally driven by pneumonia. Heterozygote animals (carriers of the recessive allele) have normal development.

DUMPS – Deficiency of Uridine Monophosphate Synthase (DUMPS) is another important genetic disorder of Holstein breed. It is characterized by a recessive mutation in the *UMPS* gene, resulting in deficiency of the *UMPS*. This enzyme is part of the pyrimidine synthesis pathway, which comprises the process of RNA and DNA synthesis. Homozygote embryos for this mutation die around the 40th day, since pyrimidines are greatly needed during that embryonic stage. Heterozygote cows have elevated level of orotic acid in the urine and milk.

CVM – Complex vertebral malformation (CVM) is a syndrome that include congenital growth retardation, vertebral malformation and deformation of the ventricular septum. The syndrome is caused by a mutation in the *SLC25A53* gene, which encodes a protein that plays an important role in the formation of the vertebra. Similar to other recessive genetic diseases, such as DUMPS and BLAD, carrier animals develop normally, while recessive animals die shortly after birth.

OPN (osteopontin) – Studies with Holstein animals, showed that this gene is associated with milk yield and also with fat and protein percentage in milk. Other studies also demonstrated that this marker is also associated with growth traits.

5. Zootechnical Performance

For the current evaluation, 138,194 records were used. Those included milk yield and genealogy data, originated from herds supervised by the Dairy Control Service, and provided by Girolando Breeders Association. The milk yield of first lactations (19,979) was edited for age at first calving (560 to 1,650 days), year of birth (1997 to 2012), year of calving (2000 to 2013), breed composition (2/8 to 7/8 HOL:G), causes of lactation termination, herd size and contemporary groups for herd-calving year. Lactations included in those analyses met the criteria of pertaining to a herd that had at least three controlled lactations and used at least two bulls in the same year.

The productive performance at first lactation of 19,979 controlled Girolando cows, pertaining from 727 collaborator herds, in the period from 2000 to 2013, is shown in Table 1 and Figures 8 and 9. The general average production of milk in 305 days in the period was 4,534 kg. The average total milk production and duration of lactation were 5,068 kg and 292 days, respectively, for the average age at the first calving of 1,070 days.

Table 1. Number of herds and lactations, average milk production in 305 days and total milk yield of the first lactation, duration of lactation and age at the first calving of cows from the Girolando breed during the period from 2000 to 2013.

Calving year	Number of herds	Number of lactations	Milk yield (kg)		Lactation length (days)	AFC ¹ (days)	FCI ² (days)	Obs. ³
			In 305 days	Total				
2000	39	473	3,657 ± 1,790	4,113 ± 2,303	299 ± 99	994 ± 158	440±97	316
2001	53	571	3,531 ± 1,572	3,916 ± 1,884	293 ± 92	1,026 ± 175	436 ± 94	371
2002	55	584	3,430 ± 1,491	3,768 ± 1,898	282 ± 87	1,029 ± 186	441±98	364
2003	61	758	3,378 ± 1,612	3,749 ± 1,909	293 ± 91	1,008 ± 165	448±103	501
2004	62	735	3,634 ± 1,588	4,076 ± 1,884	305 ± 93	1,043 ± 167	447± 93	458
2005	86	831	3,726 ± 1,571	4,106 ± 1,941	303 ± 94	1,093 ± 190	451 ± 92	485
2006	94	1,035	3,666 ± 1,599	4,069 ± 2,062	292 ± 102	1,103 ± 167	447 ± 92	544
2007	102	1,005	3,901 ± 1,813	4,292 ± 2,322	300 ± 91	1,107 ± 185	447 ± 88	508
2008	113	1,305	4,331 ± 1,881	4,884 ± 2,535	316 ± 97	1,119 ± 178	432 ± 90	759
2009	131	1,693	4,461 ± 1,972	4,966 ± 2,585	327 ± 118	1,102 ± 184	432 ± 95	1,005
2010	203	2,999	4,600 ± 2,216	5,195 ± 3,042	306 ± 105	1,092 ± 187	456 ± 82	964
2011	253	3,024	4,819 ± 2,123	5,346 ± 2,684	307 ± 99	1,062 ± 196	467 ± 91	1,259
2012	241	3,995	5,480 ± 2,130	6,235 ± 2,817	320 ± 99	1,047 ± 201	407 ± 78	1,651
2013 ⁴	128	973	5,483 ± 2,326	5,697 ± 2,484	284 ± 70	1,052 ± 196	324 ± 50	42
General	727	19,977	4,534 ± 2,380	5,068 ± 2,696	291 ± 10	1,067 ± 190	445 ± 124	10,627

¹Age at first calving; ²First calving interval; ³ Number of observations for FCI; ⁴Only lactations initiated up to October 2013 were included.

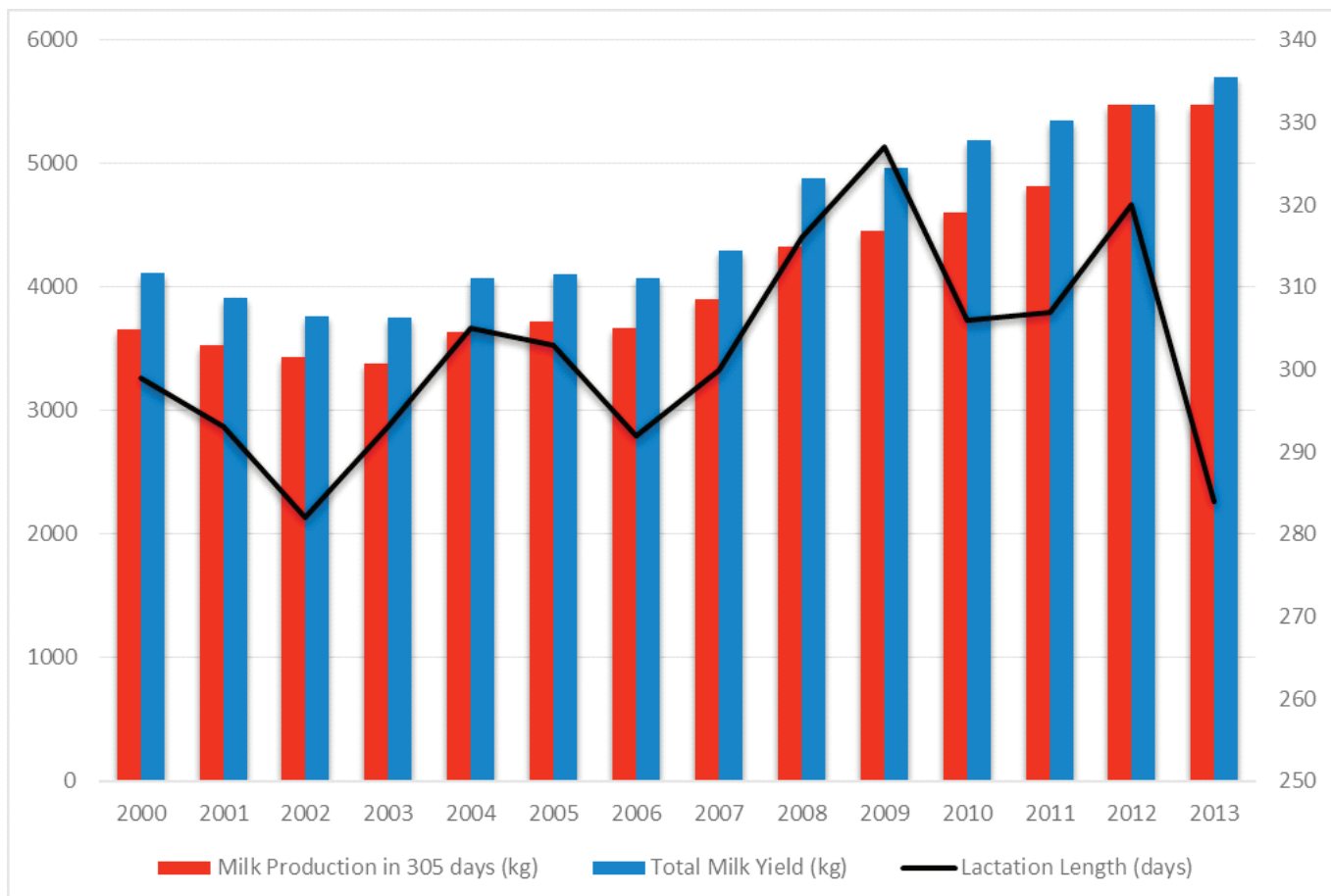


Figure 8. Average milk production in 305 days, total milk yield of the first lactation and lactation length of Girolando cows from 2000 to 2013.

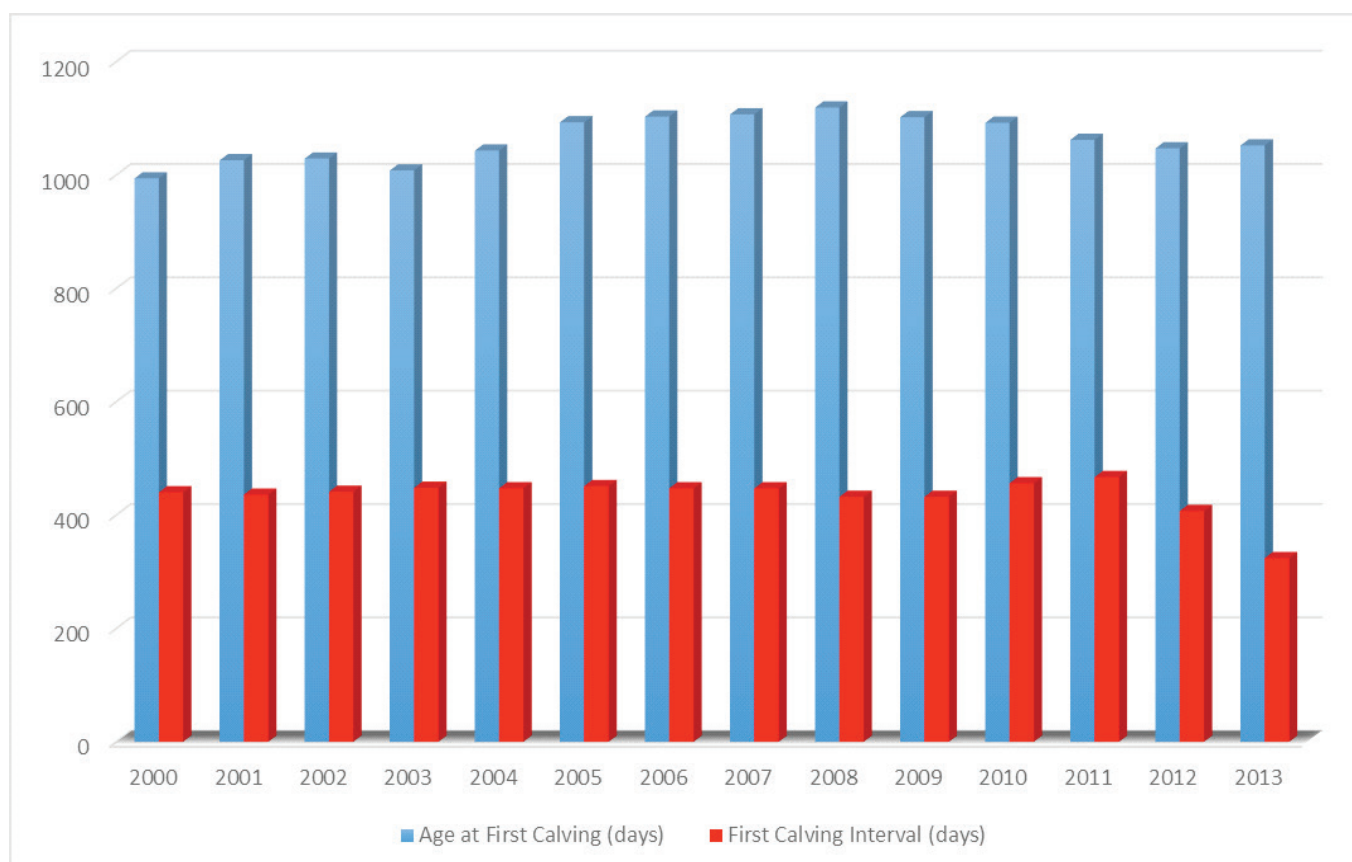


Figure 9. Average first calving interval (FCI) and age at first calving (AFC) of Girolando cows from 2000 to 2013.

6. Progeny Test and Genetic Evaluation of Bulls

The Girolando Breed Genetic Improvement Program (PMGG) has been underway for 17 years, under technical coordination of Embrapa Dairy Cattle. The PMGG is geared toward dairy control and the use of artificial insemination in the herds of breeders (Annex 3) for the conduction of the Girolando Bull Progeny Test. The progeny test started in 1997 and 57 sires of the first eight groups have already been tested. Six other groups that are currently under testing (Annex 1) and include 96 sires whose semen doses were distributed between 2008 and 2013 and 27 sires whose semen doses were distributed in 2014.

6.1. Distribution of Progeny Test Semen

For the Progeny Test to be conducted it is necessary that sires and dams are available to breeders. Sires must be of excellent genetic origin and be selected by a technical board. The criteria for selection are specified in the regulation for the participation of bulls in the Girolando Breed Progeny Test. The selected sires are divided into groups according to the year of registration. The dams to be inseminated with the coded semen from these bulls are called collaborative dams. For each group of bulls, the period from the distribution of the coded semen to the publication of the first results of the progeny test take in average six years. This is due to factors such as the period of distribution, use of semen by breeders, gestation period of the dams, age at first calving, lactation period of the bulls' daughters and time for analysis of dairy control and genealogy data (Table 2).

The average time estimated for the publication of the first results is 71 months, that is, 5 years and 11 months after the start of the distribution of semen to the collaborating herds. This period may be shorter or longer, according to the time necessary for the execution of each of the stages. The most relevant stages of the test are the use of the semen and the collection of data regarding age at the first calving for the bull's daughters. Another stage of high importance is the distribution of semen, as the faster this occurs, the less time

is necessary for the collaborative dams to be inseminated. The years of registration and semen distribution, as well as for the disclosure of the first results of each sire group of the Girolando progeny test are in Table 3.

Table 2. Time for the realization of the Progeny Test.

Stage	Duration (months)
Semen distribution	6
Use of semen in the herds	6
Gestation of collaborative matrixes	9
Average age at first calving	36
Average period of lactation of bulls' daughters	10
Data analysis	4
Total Duration	71

Table 3. Years of registration and distribution of semen from sires pertaining to 15 groups of the Girolando Progeny Test.

Group	Registration	Distribution	Results
1	1996	1997	Available in 2004
2	1997	1999	Available in 2005
3	2000	2001	Available in 2007
4	2001	2002	Available in 2008
5	2003	2004	Available in 2009
6	2004	2005	Available in 2010 and 2011
7	2005	2006	Available in 2011
8	2006	2007	Available in 2013
9	2007	2008	Available in 2014
10	2008	2009	Predicted for 2015
11	2009	2010	Predicted for 2016
12	2010	2011	Predicted for 2017
13	2011	2012	Predicted for 2018
14	2012	2013	Predicted for 2019
15	2013	2014	Predicted for 2020

Results of the groups 10 to 15 may become available after five or six years, varying according to the performance of the collaborator herds and each individual animal. In 1998, 2000 and 2003, there was no semen distributed. This fact disrupted the timing of this phase and the disclosure of the first results of the other groups of sires.

6.2. Statistical Model and Analysis Methodology

The model used for the genetic evaluation milk yield included the fixed effects of herd-year of calving, season and age of the cow at calving as a covariate, with the linear and quadratic components. The other effects included were the fixed cow breed composition (defined as the contribution of Holstein and Gyr breeds, in proportions varying from 2/8 to 7/8), and the random effects of the animal and experimental error. The predicted breeding values of each animal were obtained through the Best Linear Unbiased Prediction (BLUP) methodology using the program MTDFREML (1995). General information about the database, the values of the estimates of the variance components and heritability used is presented in Table 4.

Table 4. Estimative of the heritability (h^2) for milk yield in 305 days and age at first calving and the genetic correlation of those traits.

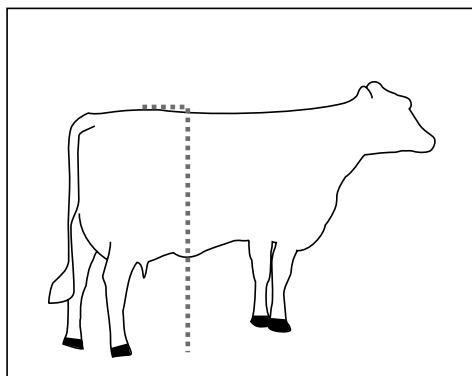
Trait	Heritability	Genetic correlation
Milk yield in 305 days	0.29	
Age at first calving	0.18	-0.60

The breeding values of the bulls were expressed as the Predicted Transmitting Ability (PTA) in relation to the genetic base, defined as the average of the breeding values of 742 cows born in 2000.

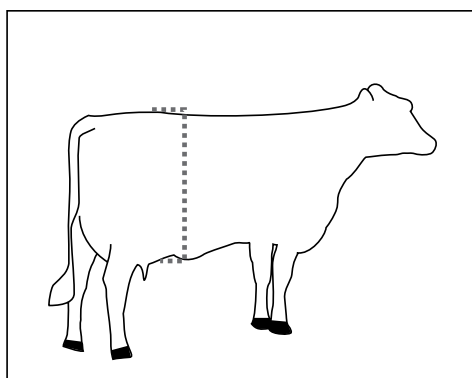
7. Girolando Linear Evaluation System – SALG

The aim of the Girolando Linear Evaluation System (SALG) is to measure and evaluate the conformation and handling traits of Girolando animals, and therefore, to generate highly reliable data that can be used for the prediction of breeding values for bulls in the progeny test. These predictions will be useful for breeders to select sires and dams, with the objective of improvement of economically important traits. This year, genetic values for an additional seven conformation traits were included in the Girolando sire report, totaling 12 evaluated traits. The traits measured and evaluated through SALG are briefly described below.

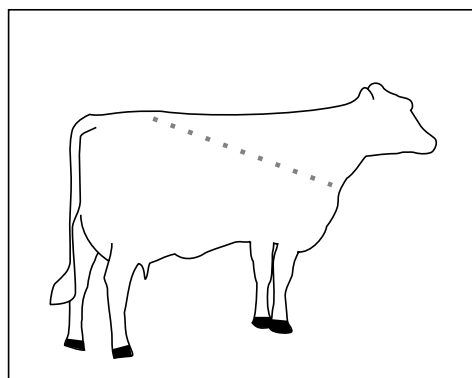
7.1. Body Capacity Measurements



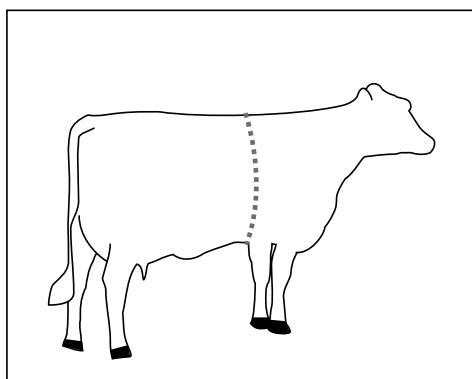
7.1.1. Rump height: measured using a measuring stick. The device is placed above the rump, close to the hook bone, to the ground. Ideally, the rump should be high enough for the udder to be sufficiently far from the ground in order to reduce the risks of injuries and contamination.



7.1.2. Body depth: measured using a measuring stick. The device is placed at the region immediately behind the rump, before the hooks (lumbar region), up to the lower line of the animal's belly, the cranial portion of the previous udder insertion. This trait is directly related to the animal's digestive and productive capacity. The body depth should be above the breed average.

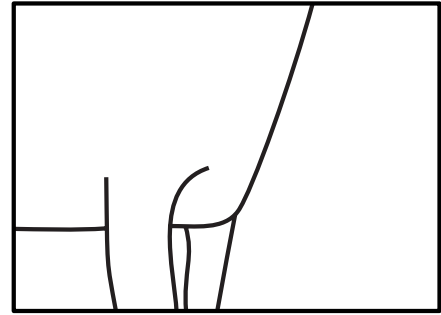
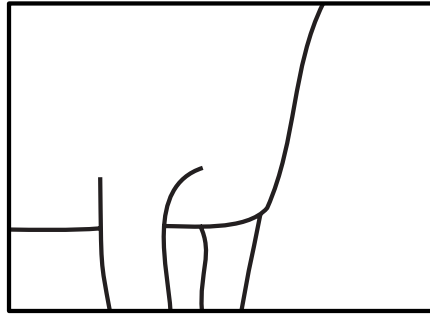
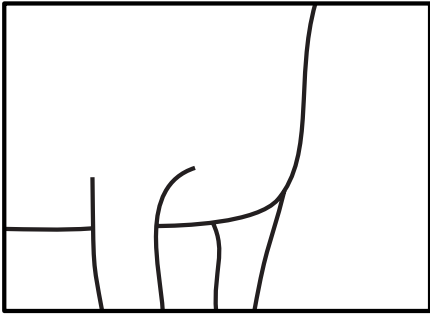


7.1.3. Body length: the measure is taken from the point of the scapula to the hook bone, using a measuring stick. It is related to the animal's respiratory, digestive and productive capacity. Body length should be above the breed average.

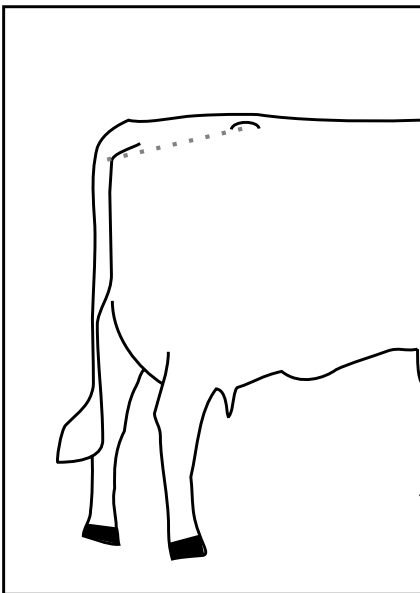


7.1.4. Thoracic perimeter: the circumference of the animal's thorax is measured using a measuring tape. It is strongly related to the cardiac and respiratory capacities. The thoracic perimeter should be above the breed average.

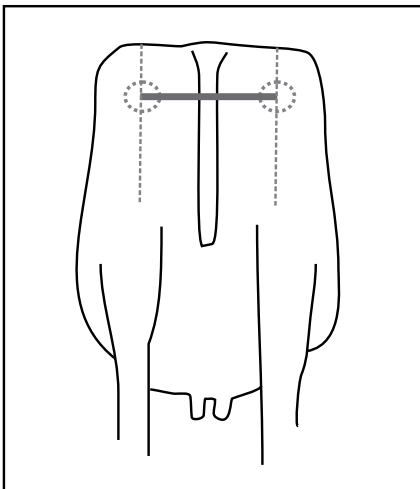
7.1.5. Chest amplitude: evaluated by means of a score. The distance between the back members is evaluated and refers to the animal's strength. The grades vary from 1 to 9: extremely closed chest is grades as 1, intermediary amplitude grades as 5 and an extremely ample chest is graded as 9.



7.2. Rump Measurements

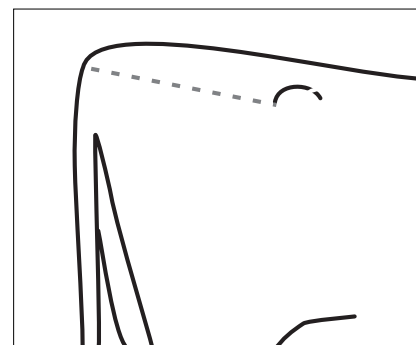
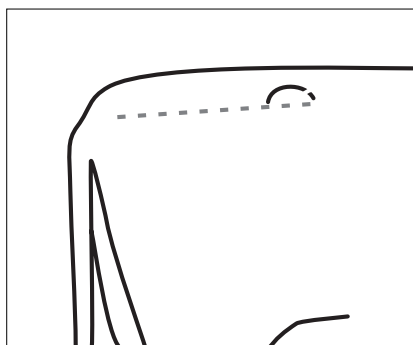
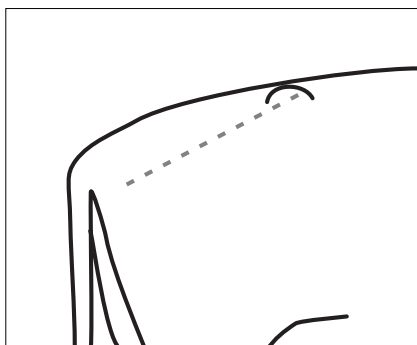


7.2.1. Rump length: is the distance between the point of the pin bone and the point of the hook bone, measured using a stick or tape. Rump length strongly influences the quality and the support of the mammary system, as it is the dorsal support of the udder. High values, above average, are favorable.



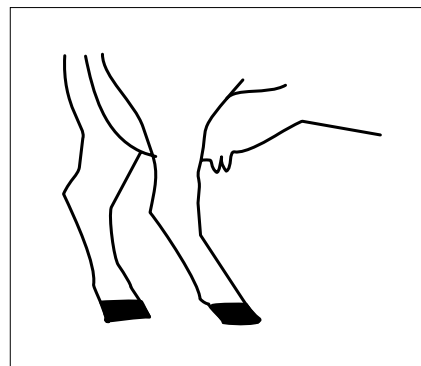
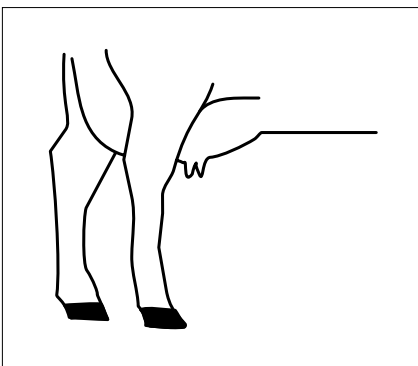
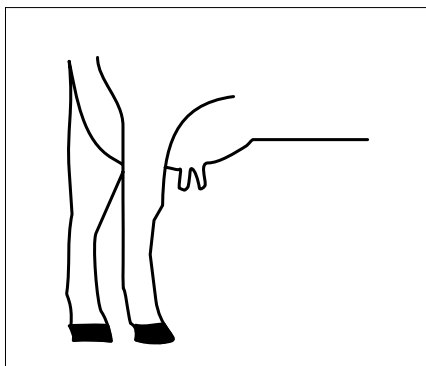
7.2.2. Width between pin bones: is the distance from the left point to the right point of the pin, measured using a measuring stick or tape. Higher values are related to greater calving facility for the animal and better dorsal support of the udder.

7.2.3. Rump angle/inclination: the angle of the rump is assessed by measuring the height of the hook bones, height of the pin bones and length of the rump. The inclination of the hook bone is calculated in relation to the pin bone. The value obtained can be either positive or negative. Above zero indicates a smooth rump. Below zero indicates an inverted rump, which leads to problems during calving and elimination of the placenta. The ideal value is as close to zero as possible.

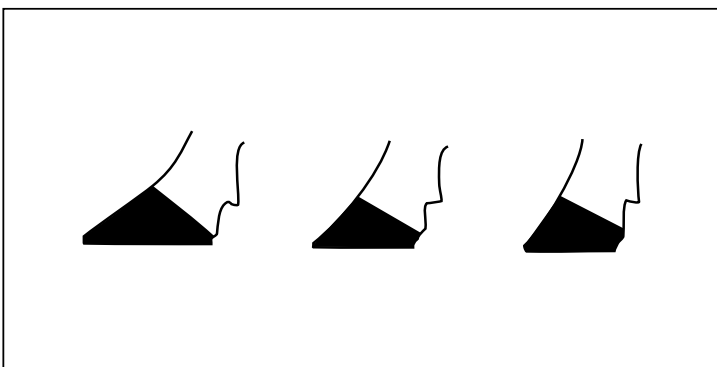
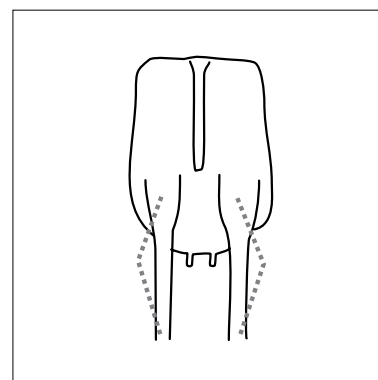
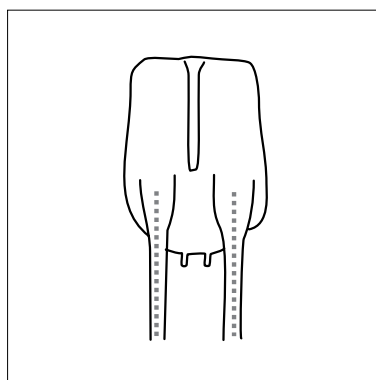
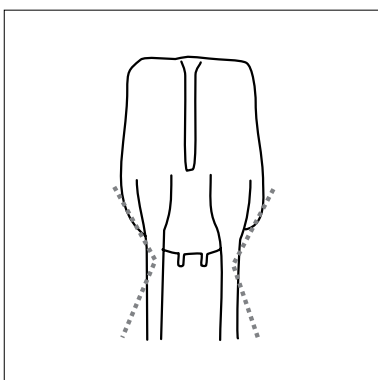


7.3. Legs and Feet

7.3.1. Legs - side view: the angle of the leg's curvature is evaluated through a score. Score 1 is given for very curved legs, 5 for intermediary legs (ideal) and 9 for extremely straight legs. At the height of the hock, the legs should have slight curvature, which should not be accentuated. Very curved legs may lead to wear of the hoof claws, making them cracked and very straight legs may cause mobility problems. The ideal score is close to 5.



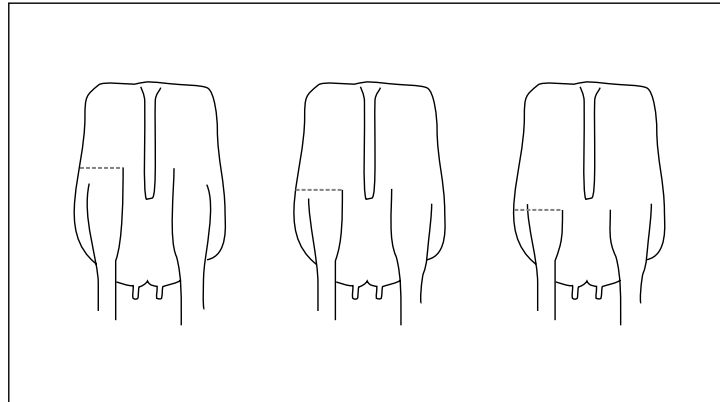
7.3.2. Legs - rear view: the position of the back legs is evaluated based on a score from 1 to 9. Score 1 is given for legs with very closed hocks, 5 for parallel legs (ideal) and 9 for legs with open hocks. Legs with closed hocks may crush and reduce udder space, causing injury and increasing the occurrence of mastitis, while very open legs may cause mobility problems.



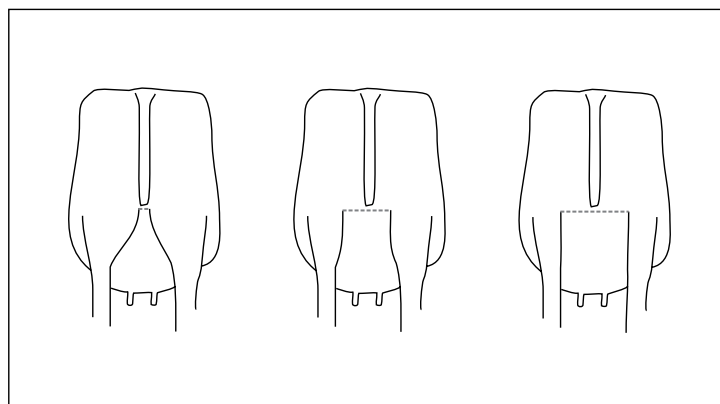
7.3.3. Hoof angle: is evaluated by means of a score. For good animal mobility, it is important that the hooves are strong and set at a good angle (close to 45°). Score 1 is given for very low angle hooves, 5 for hooves with an angle close to 45° (ideal) and score 9 for extremely steep angle hooves.

7.4. Posterior Udder

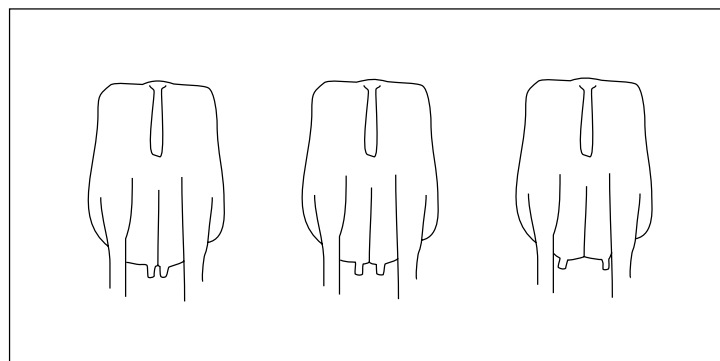
7.4.1. Rear udder height: is the distance between the base of the vulva to the fore udder insertion, in the perineal region. It is measured using measuring tape. It is related to the length and milk storage capacity of the fore udder. The higher, the better.



7.4.2. Rear udder width: is the distance between the left and right rear ligament of the udder. It can be measured with a measuring tape or ruler. It is strongly related to milk production and storage capacity.

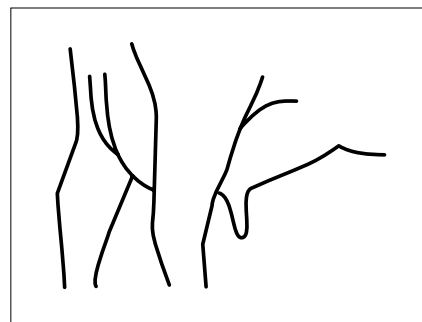
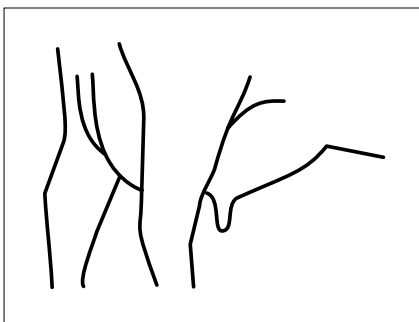
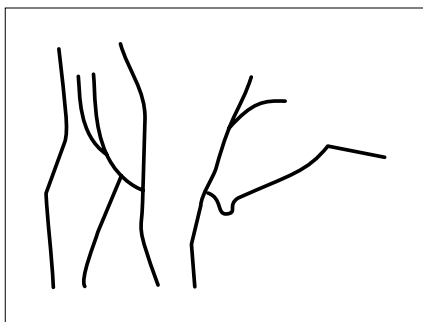


7.4.3. Rear teat placement: is evaluated based on a score from 1 to 9, 1 given for low quality placement, 5 for intermediary placement and 9 for extreme quality placement. The rear teats must be centered in the udder quarters. Values close to 9 are preferable, indicating more centralized teats than low values, which means open teats, placed on the sides of the quarters and which complicates mechanized milking.



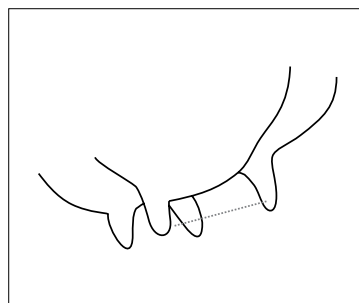
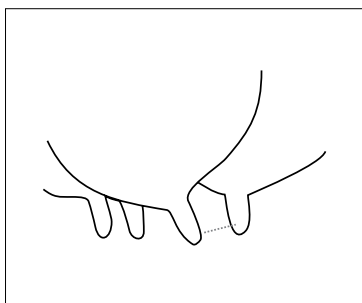
7.5. Anterior Udder

7.5.1. Teat length: the front teats of the animal are measured using a measuring tape or ruler. The ideal length of the teats is around 5 to 7 cm. Long teats are associated with inefficient colostrum nursing and mechanized milking. Also, they are related to increased incidence of teat loss and mastitis.

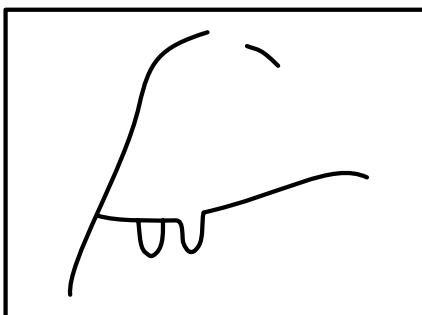
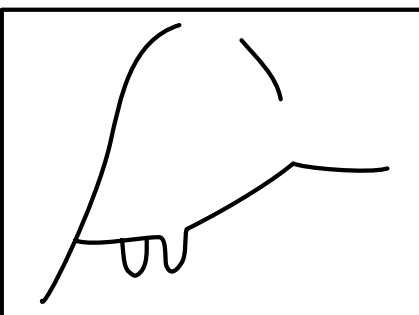
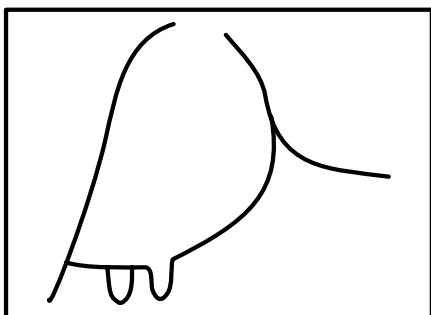


7.5.2. Teat diameter: is measured using a caliper, placed on the teat base. Wide teats are associated with inefficient colostrum nursing and mechanized milking. Also, they are related to increased incidence of teat loss and mastitis.

7.5.3. Front teat placement: the placement of the front teats is evaluated through a score. The score varies from 1 to 9: 1 is given for low quality placement, 5 for intermediary placement and 9 for extreme quality placement. The front teats must be centered in the udder quarters. Values close to 9 are preferable, indicating more centralized teats than low values, which means open teats, placed in the sides of the quarters and which complicates mechanized milking.

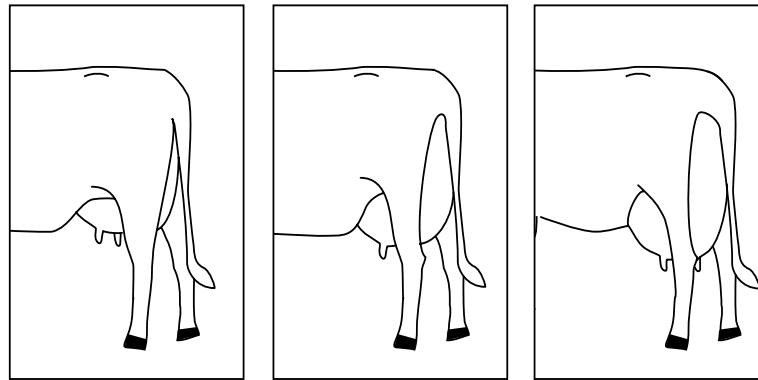


7.5.4. Ligament: the quality of fore udder insertion and support is assessed through visual evaluation (by means of a score). The evaluator can also press the area in order to feel the quality of the tissue. The fore udder must be firmly attached to the animal's ventral region, preventing the formation of swelling. This trait is of great importance, as it strongly influences the longevity of the mammary system. The score varies from 1 to 9: 1 is given for an extremely weak ligament and 9 for an extremely strong ligament.

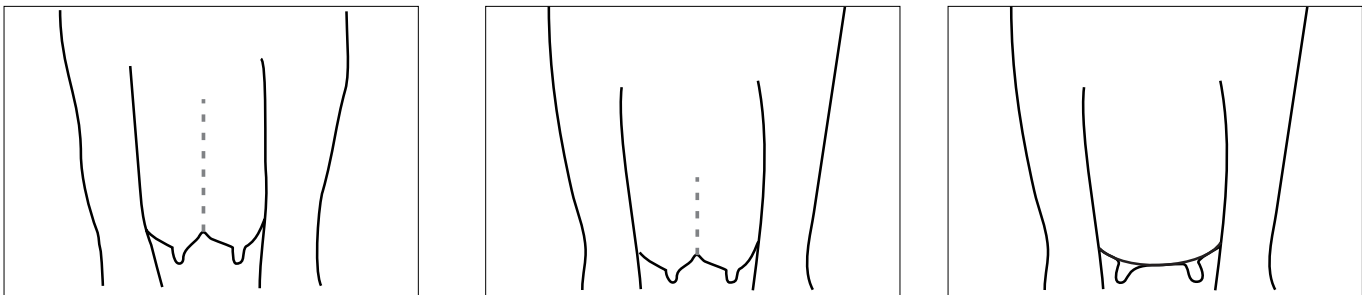


7.6. Mammary System

7.6.1. Udder depth: is the distance from an imaginary line traced from the level of the hocks to the base of the udder. It is measured using a measuring tape or ruler. This trait strongly influences the longevity of the mammary system and the quality of the fore, rear and central ligaments. The ideal udder has its base at approximately 10 cm above the hocks. Deep udders are subject to trauma.



7.6.2. Central ligament: the quality and support of the central ligament is evaluated visually. It is directly related to the longevity of the mammary system. The score varies from 1 to 9: 1 is given for an extremely weak ligament and 9 for an extremely strong ligament. It is one of them most important udder traits, as this ligament keeps the udder attached to the animal's abdomen. To support high production for a number of lactations, this ligament should be very strong. The more positive, the better.



7.7. Dairy Characterization

7.7.1. Angularity: the bone quality and dairy form of the animal is evaluated visually, considering the femininity and the angular form, also known as a wedge. The evaluation score ranges from 1 to 9: 1 given for extremely angular cows, 5 for intermediary angularity and 9 for extremely thickset cows.

7.8. Auxiliary Traits

7.8.1. Temperament: is evaluated by means of an animal docility score. More docile animals have better productive and reproductive performance. Scores vary between 1 and 9: 1 given for extremely aggressive animals and 9 for exceptionally docile animals.

7.8.2. Milking ease: is associated to the time and effort involved at the time of milking the animal. It is directly linked to milk production. Cows that are harder to milk tend to be more vulnerable to disease and to retain more milk (residual milk). For the evaluation of that trait, a score from 1 to 9 is given, very hard to milk cows are scored as 1 cows extremely easy to milk score a 9.

7.8.3. Calving ease: is related to the size of the calf and the need for assistance at the time of calving. Cows that calve easy resume post-partum estrus faster and, consequently, have better reproductive performance. This traits is evaluated by means of a score that varies from 1 to 9: 1 assigned to cows with extreme calving difficulty and 9 to cows with extreme facility in calving.

7.9. SALG Results

The averages for the traits described above are presented in Table 5. The averages for daughters of Girolando bulls participating in the Progeny Test are described.

Table 5. Averages of conformation traits and handling of cows that are daughters of Girolando bulls, measured and evaluated through SALG.

	Trait	Number of Observations	$h^2 \pm SE^{**}$	Trait Average	Standard Deviation
Body Capacity	Height at the rump (cm)	965	0.37 ± 0.14	138.7	6.8
	Body depth (cm)	741	0.34 ± 0.15	71.0	5.6
	Body length (cm)	967	0.10 ± 0.11	110.8	9.5
	Thoracic perimeter (cm)	869	0.01 ± 0.07	186.4	13.9
	Chest amplitude (cm)	822	-	3.07	0.64
Rump	Rump length (cm)	968	0.32 ± 0.14	48.0	3.6
	Width between pin bones (cm)	968	0.24 ± 0.12	19.2	2.8
	Hook bone height (cm)	741	-	135.5	6.1
	Pin bone height (cm)	741	-	128.3	5.8
Legs and Feet	Legs - side view (*)	822	-	2.93	0.6
	Legs – rear view (*)	823	-	2.84	0.5
	Hoof angle (*)	823	-	2.8	0.6
Posterior Udder	Rear height (cm)	764	0.32 ± 0.15	17.4	3.8
	Rear width (cm)	763	0.23 ± 0.13	10.1	2.9
	Teat placement (*)	770	-	3.1	0.8
Anterior Udder	Teat lenght (cm)	704	0.08 ± 0.10	5.8	1.7
	Teat placement (*)	769	-	3.4	0.7
	Ligament (*)	770	-	3.3	0.7
Mammary System	Udder depth (cm)	703	0.09 ± 0.15	13.9	4.8
	Central ligment (*)	768	-	3.3	1.7
Dairy characterization	Angularity (*)	823	-	3.4	0.6
Auxiliary traits	Temperament (*)	823	-	3.6	0.7
	Milking ease (*)	649	-	3.7	0.7
	Calving ease (*)	608	-	2.8	0.6

* Traits evaluated through scores.

** Heritability \pm Standard error.

7.10. How to Interpret the Results

In order to better understand the results of the evaluations published in this report, an example of results obtained and their interpretations are presented below (Table 6). Right after the sire's registration number XXXXX, and its general classification by PTAL (XX° - in parenthesis) and its name, are the registration numbers and the names of the sire's father and mother and the PTA for milk production (PTAL), followed by reliability (REL).

Table 6. Example for interpretation of results.

XXXX (XX°)

Name of the Bull

Sire: RGD and name

Dam: RGD and name

PTA Milk = xxx.x kg REL = x.xx%

PTA AFC = xxx.x kg REL = x.xx

Trait	STA
Rump Height	-0.0326
Body Deep	1.2133
Body length	-1.3316
Thoracic perimeter	-2.7852
Rump length	-1.2409
Width between pin bones	-0.4696
Rear udder (height)	-1.1972
Rear udder (wide)	-0.0497
Length ceilings	1.2621

In the table, the results for productive traits are in the left and the genetic evaluations, STAs (standardized PTAs) for some of the evaluated conformation and management traits are in the right. STA is the standardized predicted transmitting ability (PTA) of the handling and conformation traits that allows comparison of the traits, even when they were measured in different units, as they are expressed as standard deviations. Thus, the breeder can evaluate a sire's ability to improve a specific trait, in case of the sire is bred with an average cow of the herd. STA values vary from -3 to 3 standard deviations.

The first column, under the title **Traits**, contains the names of the traits and under the name **STA**, are the traits' respective standardized predicted transmitting abilities (standard deviation values of -3 to 3). The line in front each of the traits indicates its confidence interval, a measure related to the average and the reliability of the STA estimation. The dot on the line corresponds to the STA estimate. The smaller the line, the greater the reliability of the STA value, and contrariwise. Furthermore, the line expresses the confidence for the estimated STA averages within these limits that is expected for future mating, in 95% of the cases. It is important to stress that this information must be used with the aim of complementarily in mating.

Conformation and management trait deviations on the right or left mean that there will be genetic progress in the selected direction. For example, if a cow has very large teats (above average), the ideal situation would be to mate it with a sire that has an STA close to zero for teat length, seeking to correct this problem in the next generation. The same rationale should be applied to other traits.

A sire must have a positive milk PTA value and enough daughters evaluated by SALG (for higher reliability of the results) in order to have its conformational and management traits published.

7.11. STAs for Conformation

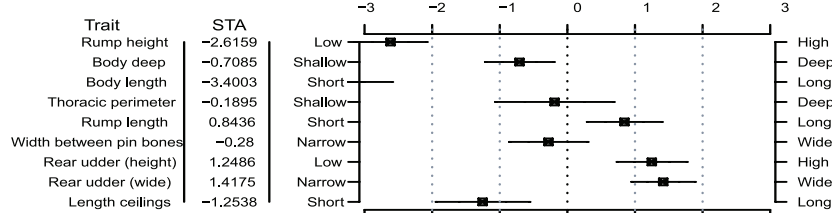
0300 (16th) 110 Billy Fancy Paul Y

Sire: HBB/A-46275 Uttag Valiant Fancy Paul - ET

Dam: D-3642 Panorama IY

PTAL = 30 kg REL 93%

PTA AFC = 6.91 dias REL 95%



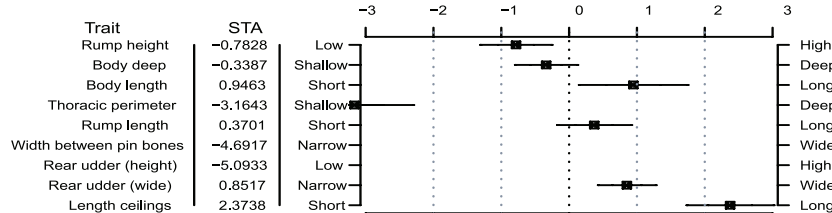
0734 (5th) Cowboy Addison Rancho Alegre

Sire: HBB/AX-104811 Etazon Addison-ET

Dam: 0640 Mágica Rancho Alegre

PTAL = 35 kg REL 96%

PTA AFC = 9.02 dias REL 94%



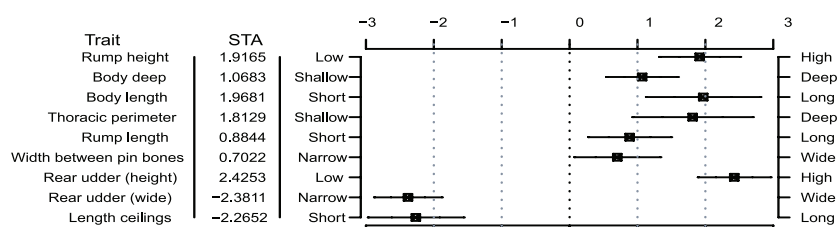
0717 (7th) Fausto Polo Itaúna

Sire: HBB/A-61270 B-Hiddenhills Mark-O-Polo TL

Dam: 1406 Bolacha Oásis Itaúna

PTAL = 208 kg REL 92%

PTA AFC = -3.12 dias REL 88%



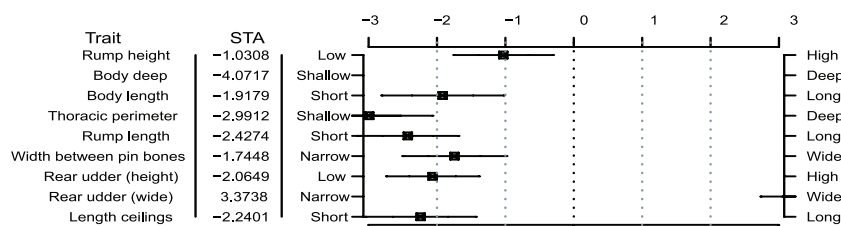
0621 (5th) Kaïen Celsius Itaúna

Sire: 528 Etazon Celsius-ET

Dam: Emboaba Everest Itauna

PTAL = 278 kg REL 81%

PTA AFC = -18.39 dias REL 76%



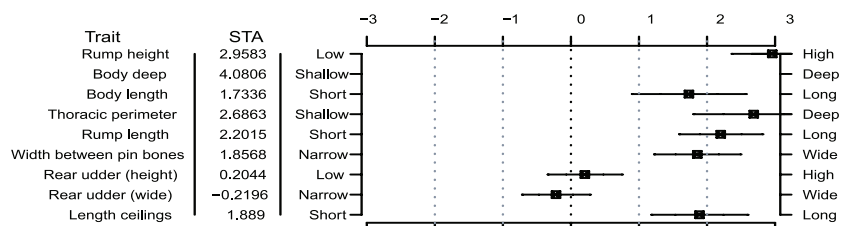
0931 (8th) Lion Império Itaúna

Sire: 0604 Império Paviljon Itaúna

Dam: 6098 Gama TE Mason Itaúna

PTAL = 197 kg REL 90%

PTA AFC = 0.63 dias REL 85%



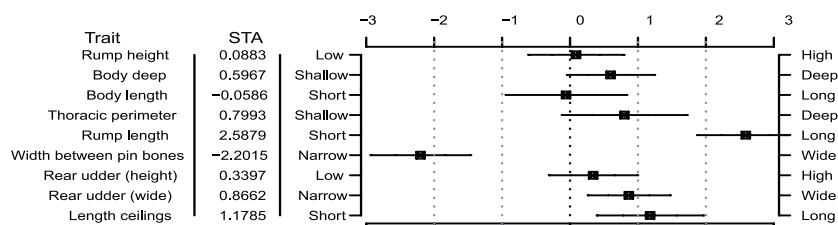
0983 (1st) Tango Storm Renascer

Sire: HPB (M1151) Mi-Bren Mathie Storm

Dam: 1/4 (RF-0032) Morena Renascer

PTAL = 479 kg REL 89%

PTA AFC = -18.64 dias REL 84%



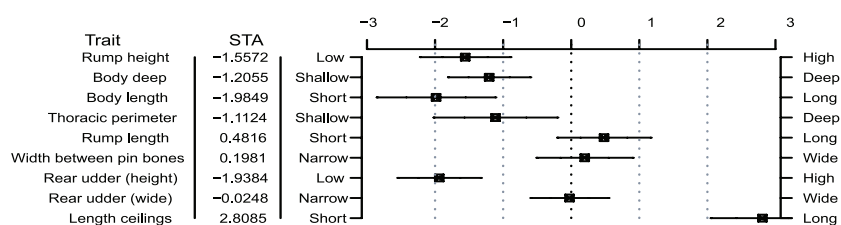
0945 (10th) Turbante Touch das Arábias

Sire: HBB/AX-80928 Dinomi Melwood Touch TL

Dam: 1/4 (RF-0229) Maravilha das Arábias

PTAL = 139 kg REL 89%

PTA AFC = -5.86 dias REL 83%



8. PTAs for Milk Production and Age at First Calving

The results of the genetic evaluation of sires, pertaining to the 10 groups tested since 1997, are presented in Tables 7 and 8. Those contain the registration number and the name of each Girolando sire, the PTA for milk yield, the age at first calving (AFC), the reliability of each test, with the respective numbers of daughters and herds evaluated, as well as the sire's genotypes. These results are presented for sires used in at least three herds, with a minimum confidence interval of 60% for milk yield PTA.

Table 7 contains the results of the tests of nine bulls from the ninth group and three sires from the tenth group of the progeny test. The PTA for milk yield ranged from -459 kg to 456 kg, and five sires had positive genetic values and seven had negative values. Out of the positive PTA sires, one is a PS, two are 5/8 HOL:G and two are 3/4 HOL:G.

Table 8 contains the general results and the genotypes for all sires tested since 1997. The PTAs ranged from -764 kg to 479 kg, and 16 sires had positive genetic values and 53 had negative values. Among the 16 sires that had a positive PTA for milk yield, three are PS, eight are 5/8 HOL:G and five are 3/4 HOL:G. The PTA for age at first calving ranged from - 40.4 to 41.4 days, positive values were observed in 42 sires and negative values were observed in 27 sires (Table 8).

The negative genetic correlation of milk yield in 305 days during the first lactation and age at first calving (Table 4) indicates that genes related to the former trait have an opposite effect under the later trait. It seems that daughters of sires that have a higher genetic value for milk yield in up to 305 days tend to have a more accelerated growth or earlier maturity. Hence, it can be concluded that selection for milk yield results also in earlier calving heifers. In this case, it should be stressed that sires that have a negative value for age at first calving (AFCPTA) are desirable, as daughters of a sire that has a AFCPTA of -10 days are prone to firstly calve 10 days earlier than daughters of sires that have AFCPTA equal to zero.

Table 7. Results and genotypes of the ninth and tenth group of Girolando Breed Progeny Tests sires, ranked by PTA milk in 2014.

Rank	RGD	Genetic composition (H)	Sire	PTA milk (kg)	R. PTA Milk (%)	PTA AFC ¹ (d)	R. AFC ¹	Molecular markers							Semen available AI Company
								K- <i>CM</i> ²	B-LGB ³	DGAT 1 ⁴	BLAD ⁵	DUMPS ⁶	CVM ⁷	OPN ⁸	
1	1248 5/8	5/8	Impacto FIV da Prta JAC	456	0,82	-27,02	0,75	AA	AA	KK	TL	TD	TV	CT	Alta Genetics
2	806 3/4	3/4	Luter King TE Terra Vermelha	445	0,81	-36,31	0,76	AA	AA	KK	TL	TD	TV	TT	Sembra
3	1154 5/8	5/8	Jacuba Titânio Bem Feitor Celsius	146	0,62	-20,24	0,60	AA	AB	AK	TL	TD	TV	TT	Alta Genetics
4	917 3/4	3/4	Abdu Lord Lily Santa Luz	121	0,84	3,35	0,79	AA	AA	AK	TL	TD	TV	TT	CRV Lagoa
5	0016 PS	PS	Notebook das Três Passagens	42	0,63	30,97	0,57	AA	AA	AK	TL	TD	TV	TT	Not available
6	0007 PS	PS	Neon das Três Passagens	-86	0,68	22,02	0,63	AA	AA	AA	TL	TD	TV	CT	CRV Lagoa
7	1167 5/8	5/8	Globo Billy JAC	-102	0,78	-21,64	0,72	AA	AA	AK	TL	TD	TV	CC	Alta Genetics
8	855 3/4	3/4	Garimpo Boss JGVA	-120	0,82	-19,12	0,74	AA	BB	AA	TL	TD	TV	CT	Alta Genetics
9	797 5/8	PS	Netuno Famoso Dona Beja	-209	0,63	-6,96	0,58	AA	AB	KK	TL	TD	TV	TT	Alta Genetics
10	1204 5/8	5/8	Dillon Ito das Árábias	-340	0,69	1,40	0,62	AA	BB	AA	TL	TD	TV	CT	Alta Genetics
11	0014 PS	PS	RBC Singelo	-449	0,79	25,08	0,72	BB	AB	AK	TL	TD	TV	CT	CRV Lagoa
12	973 5/8	5/8	Ébano Gordon da Limeira	-459	0,91	-14,93	0,86	AA	BB	AK	TL	TD	TV	TT	ABS Pecplan

¹ **AFC** - Age at first calving (days).

² **Allele A** - High yield for cheese, **Allele B** - low yield for cheese.

³ **Allele A** - High milk yield **Allele B** - High protein and fat milk content.

⁴ **Allele A** - Increase in milk and protein production, **Allele K** - Reduction in milk protein content and increase in milk fat content.

⁵ **BL** - Heterozygote animal - carrier of the allele for BLAD, **TL** - Homozygote animal - non-carrier of the allele for BLAD

⁶ **DP** - Heterozygote animal - carrier of the allele for DUMPS, **TD** - Homozygote animal - non-carrier of the allele for DUMPS

⁷ **CV** - Animal - Heterozygote animal - carrier of the allele for CVM, **TV** - Homozygote animal - non-carrier of the allele for CVM

⁸ **Allele C** - Associated to increased protein and fat milk content, **Allele T** - Associated to elevated weight gain.

Table 8. General results and genotypes of the sires tested by the Girolando Progeny Test, ranked for PTA milk, in 2014.

Rank	Group	Reg.	Genetic composition (H)	Sire	PTA Milk (kg)	R.	PTA AFC ¹ (d)	R AFC ¹	Molecular Markers					CVM ⁷	OPN ⁸	Semen available AI Company
									K-CM ²	B-LGB ³	DGAT 1 ⁴	BLAD ⁵	DUMPS ⁶			
1	7	0983 5/8	5/8	Tango Storm Renacer	479	0.89	-18.64	0.84	AA	AA	AA	TL	TD	TV	TT	Alta Genetics
2	10	1248 5/8	5/8	Impacto FIV da Prata JAC	456	0.82	-27.02	0.75	AA	AA	AA	TL	TD	TV	CT	Alta Genetics
3	10	806 3/4	3/4	Luter King TE Terra Vermelha	445	0.81	-36.31	0.76	AA	AA	AA	TL	TD	TV	TT	Sembra
4	8	780 3/4	3/4	Argeu Leduc Santa Luccia TE	423	0.87	-40.36	0.81	AA	AA	AA	TL	TD	TV	TT	Alta Genetics
5	5	0621 5/8	5/8	Kaieu Celcius Itaiúna	278	0.81	-18.39	0.76	BB	AA	AA	KK	TL	TV	CT	Não disponível
6	8	684 5/8	PS	Nicolau Fausto Itaiúna	238	0.81	-17.92	0.74	AA	AA	AA	KK	TL	TV	TT	Alta Genetics
7	4	0717 5/8	5/8	Fausto Polo Itaiúna	208	0.92	-3.12	0.88	AA	BB	KK	TL	TD	TV	TT	Alta Genetics
8	6	0931 5/8	PS	Lion Império Itaiúna	197	0.90	0.63	0.85	AA	AA	AA	TL	TD	TV	TT	ABS Pecplan
9	9	1154 5/8	5/8	Jacuba Titânio Bem Feitor Celcius	146	0.62	-20.24	0.60	AA	AB	AK	TL	TD	TV	TT	Alta Genetics
10	6	0945 5/8	5/8	Turbante Touch das Árábias	139	0.89	-5.86	0.83	AA	AA	KK	TL	TD	TV	TT	Alta Genetics
11	10	917 3/4	3/4	Abdu Lord Lily Santa Luz	121	0.84	3.35	0.79	AA	AA	AK	TL	TD	TV	TT	CRV Lagoa
12	9	0016 PS	PS	Notebook das Três Passagens	42	0.63	30.97	0.57	AA	AA	AK	TL	TD	TV	TT	Alta Genetics
13	8	754 3/4	3/4	Diamante Billy da Cacá	38	0.71	-7.02	0.64	AA	AA	AK	TL	TD	TV	CT	Alta Genetics
14	8	1065 5/8	5/8	Ocidente London do Morro	36	0.78	-29.58	0.70	AA	BB	AK	TL	TD	TV	CT	CRV Lagoa
15	5	0734 5/8	5/8	Cowboy Addison TE Rancho Alegre	35	0.96	9.02	0.94	AB	AA	AA	KA	TL	TD	TV	TT
16	1	0300 3/4	3/4	110 Billy Fancy Paul Y	30	0.95	6.91	0.93	AA	AA	AA	KK	TL	TD	TV	CC
17	4	0541 3/4	3/4	MBF 0246	-4	0.72	-13.77	0.66	AA	AA	AK	TL	TD	TV	CT	Alta Genetics
18	7	0880 5/8	5/8	Átila Irã da Cacá	-14	0.85	-13.35	0.78	AB	AA	AA	KA	TL	TD	TV	TT
19	2	0454 5/8	5/8	Magical Mascot TE Rancho Alegre	-16	0.91	18.23	0.87	AA	AA	AA	KK	TL	TD	TV	TT
20	5	0580 3/4	3/4	Aristóteles Grandslan TE Sta Luccia	-54	0.91	1.41	0.87	AA	AA	AA	KK	TL	TD	TV	CT
21	3	0475 3/4	3/4	Millenium Hortência Alf Boa Fé	-55	0.94	13.77	0.90	AA	AA	AA	KK	TL	TD	TV	CT
22	8	955 5/8	5/8	Índio Windstar Sertão	-68	0.88	11.20	0.83	AB	AB	AK	TL	TD	TV	TT	Alta Genetics
23	9	0007 PS	PS	Neon das Três Passagens	-86	0.68	22.02	0.63	AA	AA	AA	AA	TL	TD	TV	CT
24	7	0555 5/8	5/8	Simbolo Swinger Cal	-91	0.90	9.06	0.85	AA	AA	AA	KA	TL	TD	TV	CT
25	9	1167 5/8	5/8	Globo Billy JAC	-102	0.78	-21.64	0.72	AA	AA	AK	TL	TD	TV	CC	Alta Genetics
26	7	0997 5/8	5/8	Curimã III TE Alegre	-113	0.86	1.88	0.80	AA	AA	AA	KA	TL	TD	TV	TT
27	9	855 3/4	3/4	Garimpo Boss JGVA	-120	0.82	-19.12	0.74	AA	AA	BB	AA	TL	TD	TV	CT
28	1	0215 5/8	5/8	Santa Cruz Zape Elevation	-125	0.86	17.32	0.74	AA	AA	BB	KA	TL	TD	TV	TT
29	4	0639 5/8	5/8	Brutus das Árábias	-125	0.88	-4.51	0.83	AA	AA	AA	KA	TL	TD	TV	TT
30	2	0455 5/8	5/8	Maguito Mascot TE Rancho Alegre	-130	0.94	41.37	0.91	AB	AA	AA	KA	TL	TV	TT	Not available
31	3	0667 5/8	5/8	Zimbo das Árábias	-136	0.90	-16.28	0.86	AA	AA	AA	KA	TL	TD	TV	TT
32	5	0781 5/8	5/8	Rincão Itaipu Y	-142	0.93	33.87	0.89	AA	AA	AA	KK	TL	TD	TV	CT
33	6	0885 5/8	5/8	Jaguar das Três Passagens	-144	0.94	15.10	0.90	AA	AA	AA	KA	TL	TD	TV	CT
34	7	0636 3/4	3/4	RBC Redator	-150	0.86	-24.42	0.80	AA	AA	AA	KK	TL	TD	TV	TT
35	7	1039 5/8	5/8	Florin Marker Dom Nato	-173	0.89	12.18	0.83	AA	AA	AA	KK	TL	TD	TV	TT
36	6	0864 5/8	5/8	Império das Três Passagens	-186	0.84	25.02	0.78	AA	BB	AA	AA	TL	TD	TV	CT
37	6	0928 5/8	5/8	Soberano Adonias Santa Luccia	-191	0.91	22.96	0.86	AA	BB	AA	AK	TL	TD	TV	CT
38	6	0871 5/8	5/8	Lama Preta Hércules Twist-TE	-207	0.93	28.87	0.90	AA	BB	AA	AK	TL	TD	TV	CT
39	2	0452 5/8	5/8	Damião Bellwood 3E	-209	0.94	24.55	0.87	AB	AA	AA	KK	TL	TD	TV	TT
40	9	797 5/8	5/8	Netuno Famoso Dona Beia	-209	0.63	-6.96	0.58	AA	AB	AA	KK	TL	TD	TV	TT

(Continued...)

(Continuation...)

Rank	Group	Reg.	Genetic composition (H)	Sire	PTA Milk (kg)	R.	PTA AFC ¹ (d)	R AFC ¹	Molecular Markers							Semen available AI Company
									K-CM ²	B-LGB ³	DGAT 1 ⁴	BLAD ⁵	DUMPS ⁶	CVM ⁷	OPN ⁸	
41	5	0657 5/8	5/8	Feiteiro Riacho da Serra	-222	0.94	21.14	0.90	AA	AA	KK	TL	TD	TV	TT	ABS Pecplan
42	3	0476 3/4	3/4	Estand Luke HB	-226	0.88	-4.29	0.82	AA	AA	KK	TL	TD	TV	CT	Not available
43	8	1066 5/8	5/8	Milagre das Três Passagens	-258	0.88	0.51	0.83	AA	AA	KK	TL	TD	TV	CT	CRI Genética
44	4	0680 5/8	5/8	Famoso das Três Passagens	-260	0.96	37.12	0.94	AA	AB	AA	TL	TD	TV	CC	Alta Genetics
45	8	999 5/8	5/8	Curimã I TE Alegre	-295	0.85	4.97	0.80	AA	AA	AA	TL	TD	TV	TT	Alta Genetics
46	4	0470 5/8	5/8	Galã Fancy Paul Itaúna TE	-298	0.91	40.46	0.87	AA	AA	AA	TL	TD	TV	CT	Not available
47	4	0500 3/4	3/4	Chaplin Billy Fancy Paul Y	-298	0.91	13.72	0.85	AA	AB	KA	TL	TD	TV	CT	Not available
48	1	0350 5/8	5/8	Doutor Bellringer Itaúna	-309	0.89	-3.24	0.85	AB	AB	KA	BL	TD	TV	TT	Not available
49	6	0563 3/4	3/4	Executivo Billy Beleza Y TE	-319	0.91	-7.59	0.87	AB	AA	KA	TL	TD	TV	TT	Not available
50	1	0243 5/8	5/8	Dileto Balthazar Sonho	-333	0.89	20.49	0.69	AA	AA	AA	TL	TD	TV	TT	Not available
51	9	1204 5/8	5/8	Dillon Ito das Árábias	-340	0.69	1.40	0.62	AA	BB	AA	TL	TD	TV	CT	Alta Genetics
52	8	632 3/4	3/4	Talento Millenium Boa Fé	-345	0.86	20.94	0.80	AA	BB	KK	TL	TD	TV	TT	ABS Pecplan
53	1	0200 5/8	5/8	Azoto da Ouro Verde	-371	0.81	25.89	0.86	AA	AA	AA	TL	TD	TV	TT	Not available
54	1	0216 5/8	5/8	Santa Cruz Zinabre Dynamic	-390	0.81	-6.20	0.81	AB	AA	AA	TL	TD	TV	TT	Not available
55	3	0345 5/8	5/8	Caxi OG	-400	0.94	-0.86	0.91	AA	AA	KA	TL	TD	TV	TT	Not available
56	5	0619 5/8	5/8	Garboso Curimatã das Três Passagens	-407	0.84	9.00	0.78	AA	AA	AA	TL	TD	TV	TT	Not available
57	2	0487 5/8	5/8	Baco das Árábias	-408	0.92	18.49	0.88	AA	AA	AA	TL	TD	TV	CT	Not available
58	2	0366 3/4	3/4	Nautilus Bandit Rancharia	-437	0.86	12.30	0.81	AA	AA	KK	TL	TD	TV	CT	Not available
59	2	0410 5/8	5/8	Curimatã Três Passagens	-439	0.97	24.29	0.96	AB	AA	AA	TL	TD	TV	TT	Alta Genetics
60	9	0014 PS	PS	RBC Singelo	-449	0.79	25.08	0.72	BB	AB	AK	TL	TD	TV	CT	CRV Lagoa
61	9	973 5/8	5/8	Ébano Gordon da Limeira	-459	0.91	-14.93	0.86	AA	BB	AK	TL	TD	TV	TT	ABS Pecplan
62	3	0479 5/8	5/8	Dedé Três Passagens	-493	0.92	37.97	0.87	AA	BB	AA	TL	TD	TV	CT	Not available
63	5	0566 3/4	3/4	Escote Royalist Curral Velho	-508	0.84	25.61	0.77	AA	AA	KK	TL	TD	TV	CT	Not available
64	7	0752 5/8	5/8	Lama Preta Instrutor Cavalier	-557	0.77	-0.29	0.70	AA	AA	KA	TL	TD	TV	CT	Not available
65	3	0604 5/8	5/8	Império Paviljon Itaúna	-625	0.92	11.42	0.89	AA	AA	KA	TL	TD	TV	CT	Not available
66	2	0333 3/4	3/4	Senador S.W.D Santa Izabel	-660	0.91	6.30	0.87	AA	AA	KA	TL	TD	TV	CT	Not available
67	2	0312 3/4	3/4	BR Granito Mandingo TE	-721	0.84	23.47	0.79	AA	BB	AA	TL	TD	TV	CT	Not available
68	8	1075 5/8	5/8	Vilão TE Alegre	-758	0.96	14.33	0.93	AB	AA	KK	TL	TD	TV	TT	Alta Genetics
69	7	0559 5/8	5/8	Bátia Irã da Cacá	-764	0.76	-9.25	0.69	AB	AA	KA	TL	TD	TV	CT	Not available

¹ AFC - Age at first calving (days).² Allele A - High yield for cheese, Allele B - low yield for cheese.³ Allele A - High milk yield Allele B - High protein and fat milk content.⁴ Allele A - Increase in milk and protein production, Allele K - Reduction in milk protein content and increase in milk fat content.⁵ BL - Heterozygote animal - carrier of the allele for BLAD, TL - Homozygote animal - non-carrier of the allele for BLAD.⁶ DP - Heterozygote animal - carrier of the allele for DUMPS, TD - Homozygote animal - non-carrier of the allele for DUMPS.⁷ CV - Animal - Heterozygote animal - carrier of the allele for CVM, TV - Homozygote animal - non-carrier of the allele for CVM.⁸ Allele C - Associated to increased protein and fat milk content, Allele T - Associated to elevated weight gain.

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11. Glossary of Technical Terms

Additive Genetic Variance – The variation in the genetic values among animals of a population (breed), for a specific trait.

Allele – The alternative form of a specific gene located in the region of a homologous chromosome (*locus*). There are two alleles for each gene in diploid bovine cells, with and each allele passed down from a progenitor.

Animal Model – The procedure used to estimate genetic values or PTAs, using the registers records from the databases provided by breeder associations.

BLUP (Best Linear Unbiased Prediction) – Statistical method for data analysis, aiming to obtain solutions for the effects considered in a specific model. Among its statistical properties, the simultaneous estimation of equation solutions for fixed and random effects (genetic values) stands out as noteworthy. In practical ways, the genetic values (PTAs) are estimated simultaneously to the adjustment to the effects of the environment (contemporary herd-year groups, time, age at calving, genetic groups, etc.)

Genetic Base – The mean genetic value of cows born in a specific year, for each trait. Composed of the genetic merit reference of the breed for the comparison of bulls.

Genetic correlation – The probability that two distinct traits are determined by the same group of genes. Positive values mean that the group of genes increase the value of both traits, and negative values mean that one trait is increased and the other is decreased in response of the activation of the genes.

Genotype – The allelic constitution of a homologous chromosome region. Example: AA, Aa or aa.

Heritability – The parameter that describes the proportion of total variance for a specific trait that is due to the genetic differences among the individuals of the population (breed).

Heterozygote – The individual or genotype carrier of different alleles in one *locus*. Example: Aa.

Homozygote – The individual or genotype that presents two copies of the same allele in one *locus*. Example: AA or aa.

MTDFREML – The abbreviation for the set of programs written in the Fortran language (Multiple Trait Derivative Free REML), which uses the Restricted Maximum Likelihood methodology with the algorithm that does not use derivatives for the estimation of variance components and the prediction of animals' genetic values, in accordance with the model applied in the analysis of a specific database.

PTA (Predicated Transmitting Ability) – The measurement of the bull's genetic value, obtained through the performance of its daughters and its relatives in different herds, expressed as the difference (superiority or inferiority) of the breed's genetic base. Example: a bull with a PTA equal to 100 kg means that its progeny, on average, has an expected production potential of 100 kg of milk greater than the breed average.

Reliability (R) – The measurement of the amount of information used in the estimation of the genetic value. It indicates (in percentage) the confidence that can be placed on the PTA estimated for each bull. The greater the reliability, the greater the certainty that the value of the estimated PTA represents the real genetic value of the bull.

Annex 1. List and genotype of sires in test by the Girolando Progeny Test, ordered by group, breed composition and alphabetic order.

Sire name	Reg.	Father	Mother	Molecular Markers ¹					Semen available -		
				K-CW ²	B-LGB ³	DGAT 1 ⁴	BLAD ⁵	DUMPS ⁶	CVM ⁷	OPN ⁸	AI Company
10 th Group - Results expected in 2015											
Bau das Árábias	0030 PS	Brutus das Árábias	Rochona II das Árábias	AA	AA	AK	TL	TD	TV	TT	ABS Pecplan
Cacique Índio Serião	1294 5/8	Índio Windstar Serião	Madame Serião	AB	BB	KK	TL	TD	TV	TT	Alta Genetics
Fergus TE Caxi Alegre	0010 PS	Caxi OG	Arita Vertente	AA	AA	KK	TL	TD	TV	TT	Alta Genetics
Jacuba Dark Bem Feitor Aaron	1293 5/8	Dixie-Lee Aaron-ET	Jacuba II Sara I	AA	AB	AK	TL	TD	TV	TT	Alta Genetics
Porter Kaïen Itaúna	0020 PS	Kaïen Celsius Itaúna	Gama TE Mason Itaúna	AB	AA	AK	TL	TD	TV	TT	Alta Genetics
11 th Group - Results expected in 2016											
Berílio Soberano Santa Luccia	0052 PS	Soberano Adonias Santa Luccia	Manequim Hélico Dona Beja	AA	BB	AK	TL	TD	TV	CT	CRI Genética
Diplomata Roy Santa Luzia	1284 5/8	Roylane Jordan-ET	Laranja Santa Luzia	AA	BB	KK	TL	TD	TV	CT	Alta Genetics
Falcon Ribeirão Grande TE	0812 5/8	Stouder Morty-ET	Laranja Santa Luzia	AB	BB	AK	TL	TD	TV	TT	Semex
Heros Florin Dom Nato	0131 PS	Florin Marker Dom Nato	Evelyn Magical Dom Nato	AA	AA	AK	TL	TD	TV	CT	CRV Lagoa
Imperador FIV Ribeirão Grande	1338 5/8	Sandy-Valley Bolton-ET	Laranja Santa Luzia	AA	AA	AA	TL	TD	TV	CT	ABS Pecplan
Jacuba Prime Bem Feitor Lou	0917 5/8	Jenny-Lou Marshall P149-ET	Jacuba III Carina I	AB	AB	AK	TL	TD	TV	CT	ABS Pecplan
Limão TE JRS	1413 5/8	Lexvold Luke Hershel-ET	Laranja Santa Luzia	AA	AB	AK	TL	TD	TV	CT	Alta Genetics
Raro das Árábias	0053 PS	Feticeiro Riacho da Serra	Preta Jewel das Árábias	AA	AA	AK	TL	TD	TV	TT	ABS Pecplan
RBC Arquitecto	1400 5/8	RBC Corisco	RBC Talentosa	AA	BB	AK	TL	TD	TD	CT	CRV Lagoa
Sabiá IT	1313 5/8	Mr Motel-ET	Duda Kubera IT	AA	AB	AK	TL	TD	NG	CT	ABS Pecplan
Torpedo Bolton Santa Luzia	0960 3/4	Sandy-Valley Bolton-ET	Quartinha Terra Vermelha	AA	AB	AA	TL	TD	TV	CT	ABS Pecplan
Aristeu Billy Linda Santa Luccia	0944 3/4	110 Billy Fancy Paul Y	Linda do SPA	AA	AA	KK	TL	TD	TV	CT	Semex
12 th Group - Results expected in 2017											
Deflector Rendeira Vilão FIV Boa Fé	0072 PS	Vilão TE Alegre	Rendeira Nica Millenium Boa Fé	AA	AB	AK	TL	TD	TV	TT	ABS Pecplan
Detetive Feticeiro FIV Boa Fé	0071 PS	Feticeiro Riacho da Serra	Rendeira Nica Millenium Boa Fé	AB	AB	AK	TL	TD	TV	TT	ABS Pecplan
Dólar Dabliu Delib	0064 PS	Dabliu Curimatá Dom Nato	Tabitha Windstar El Rancho	AA	AA	AK	TL	TD	TV	TT	CRI Genética
Franco Feticeiro Y	0143 PS	Feticeiro Riacho da Serra	Caroline de Mônaco Sharp Y	AA	AB	AK	TL	TD	TV	TT	Alta Genetics
IPA Bochecho	0075 PS	Zimbo das Árábias	IPA Ociosa	AA	AB	AK	TL	TD	TV	TT	Sembra
Atual Garimpo Zak TE	1096 5/8	Garimpo Boss JGVA	Estrela Tricordiana	AA	AB	AK	TL	TD	TV	TT	Alta Genetics
Imperor Bolton Santa Luzia	1211 5/8	Sandy Valley Bolton-ET	Laranja Santa Luzia	AA	AB	KK	TL	TD	TV	TT	CRV Lagoa
Jacuba Fax Bem Feitor Garter	1464 5/8	Welcome Garter-ET	Jacuba II Tais I	AA	BB	AK	TL	TD	TV	TT	CRI Genética
Jacuba Printer Bem Feitor Blitz	1465 5/8	Fustead Enory Blitz-ET	Jacuba II Natureza I	AA	BB	AK	TL	TD	TV	CT	ABS Pecplan
Netuno Astre Renascer	1662 5/8	Duregal Astre Starbuck	Morena Renascer	AA	AB	AK	TL	TD	TV	CT	ABS Pecplan
Ozias da Centrogen TE	1671 5/8	Sandy Valley Bolton-ET	Jenoca LH TE	AA	BB	KK	TL	TD	TV	CT	ABS Pecplan
Thor FIV da Prata JAC	1487 5/8	Jenny Lou Marshall Toystory-ET	Harmonia Terra Vermelha	AB	AB	AK	TL	TD	TV	CT	Semex
Alfy Cayuaba Mission Iridio TE	0993 3/4	Seaguli-Bay Mission-ET	Alfy Cayuaba Teatro Danda	AA	AB	AK	TL	TD	TV	TT	Alta Genetics
Charmoso Wildman Tannus	1021 3/4	Lady's Manor Wildman-ET	Alcachofra MAMJ	AA	BB	KK	TL	TD	TV	TT	Alta Genetics
Curio FIV Paramount JGVA	0990 3/4	Delta Paramount	Patativa Markowicz	AA	AA	AK	TL	TD	TV	CT	CRV Lagoa
Imperador Toy Story FIV Gama	1022 3/4	Jenny Lou Marshall Toystory-ET	Beldade MAMJ	AB	BB	AK	TL	TD	TD	CT	CRI Genética
Jordan Goldwyn DLS	0823 3/4	Braetdale Goldwyn	Teteia OG	AB	AB	AK	TL	TD	TV	CT	ABS Pecplan
JPZ Bulgari Millenium Lia Santa Luccia	1111 3/4	Millenium Hortência Alf Boa Fé	Lia Terra Vermelha	AA	AB	AK	TL	TD	TV	CC	ABS Pecplan
RBC Barão	0987 3/4	Ricecrest Touchdown-ET	Cajamanga AAO	AB	AA	AK	TL	TD	TV	CT	ABS Pecplan
13 th Group - Results expected in 2018											
Bambu FIV Rincão da Tropical	0045 PS	Rincão Itaipu Y	Rendeira Nica Millenium Boa Fé	AA	AB	AK	TL	TD	TV	CT	CRV Lagoa
Boticário da Olaria	0197 PS	Fausto Polo Itaúna	Ficção Olaria	AA	BB	AK	TL	TD	TV	TT	CRV Lagoa
IPA Cajano	0076 PS	Magical Mascot TE Rancho Alegre	IPA Selada	AA	AB	AK	TL	TD	TV	CT	Sembra
Júpiter FIV Rincão São Marcos	0207 PS	Rincão Itaipu Y	363 Urík Vista Alegre	AA	AA	AK	TL	TD	TV	TT	Alta Genetics
Mago Zimbo das Árábias	0313 PS	Zimbo das Árábias	Angel Touch das Árábias	AA	BB	AK	TL	TD	TV	TT	ABS Pecplan
Apolo FR Recreio	1590 5/8	Regancrest JR Defender-ET	Jacutinga FR Recreio	AA	AB	AK	TL	TD	TV	CT	CRI Genética
Duque FIV Shottle da Medalha Milagrosa	1470 5/8	Picston Shottle-ET	Lama Preta Opala Brilhante	AB	AA	AK	TL	TD	TV	CT	ABS Pecplan
General Millenium FIV TS da Muquém	1750 5/8	Millenium Hortência Alf Boa Fé	Viola Esteio Valiant LE	AA	AB	AK	TL	TD	TV	CT	CRV Lagoa

(Continued...)

Girolando Breed Genetic Improvement Program
Sire Summary
Progeny Test Results - July/2014

(Continuation...)

Sire name	Reg.	Father	Mother	Molecular Markers ¹				Semen available			
				K ² CN ²	B ³ LGB ³	DGAT 1 ⁴	BLAD ⁵	DUMPS ⁶	CVM ⁷	OPN ⁸	AI Company
Imperador Baxter Volta Fria	1459 5/8	Emerald-ACR-SA T-Baxter	Felipeta Cenoura Bazuah Volta Fria	AA	BB	KK	TL	TD	TV	CT	Alta Genetics
Imperador Jocko FIV WTF da Estiva	1600 5/8	Jocko Besn	Zumira 982 WTF da Estiva	AA	AB	AK	TL	TD	TV	TT	CRV Lagoa
Jacuba Master Benfeitor Shottle	1762 5/8	Picston Shottle-ET	Jacuba II Natureza I	AA	AB	AK	TL	TD	TV	CC	ABS Pecplan
Labirinto Don FAC	1526 5/8	Gen-Hill Anel Don-ET	Carol Paladino FAC	AA	BB	AK	TL	TD	TV	CT	CRI Genética
Minister da Prata JAC	1560 5/8	Mr. Minister	Harmonia Terra Vermelha	AA	AB	AK	TL	TD	TV	CT	Alta Genetics
Pavão Olympic IA da Terra Sagrada	1640 5/8	Delta Olympic	Fazendona da Terra Sagrada	AB	AB	AK	TL	TD	TV	CT	CRV Lagoa
Projeto Leitegen	1594 5/8	Stouder Morty-ET	Paloma Estância Correa	AA	BB	AK	TL	TD	TV	TT	CRV Lagoa
RBC Caratê	1485 5/8	Ricecrest Touchdown-ET	Padaria Retiro da Barra	AA	BB	AK	TL	TD	TV	CT	ABS Pecplan
Rei Shottle da Centrogen FIV	1671 5/8	Picston Shottle-ET	Opera da Centrogen TE	AA	AB	AK	TL	TD	TV	CT	ABS Pecplan
Rocky Goldwyn FIV RDM5	1731 5/8	Braedale Goldwyn	Laranja Santa Luzia	AB	AB	KK	TL	TD	TV	CT	Alta Genetics
Tajmahal Wildman JSM	8080-D 5/8	Lady's-Manor Wildman	Rubi Indiano OG	AA	AB	KK	TL	TD	TV	CT	Sembra
Tufão Flora Toystory Itauna	1675 5/8	Jenny Lou Marshall Toystory-ET	Flora 4 Nobre Itauna	AB	AB	AK	TL	TD	TV	CT	CRI Genética
Atual Wildman Thor TE	0747 3/4	Lady's-Manor Wildman	Estrela Tricordiana	AA	AB	AK	TL	TD	TV	TT	Alta Genetics
Galanteio XA	0409 3/4	Mr. Minister	Canção XA	AA	AB	AK	TL	TD	TV	CC	ABS Pecplan
Gold Goldwyn RPM da Santo Antônio	1122 3/4	Braedale Goldwyn	Romana Barbante RPM Santo Antônio	AA	AB	KK	TL	TD	TV	CC	Alta Genetics
JPZ Basileu Argeu Linda FIV	1203 3/4	Argue Leduc Santa Luccia TE	Linda do SPA	AA	AB	AK	TL	TD	TV	CC	CRV Lagoa
Napolitano TE Terra Vermelha	0487 3/4	Doolhof December	Quatinha Terra Vermelha	AA	AB	KK	TL	TD	TV	CT	CRV Lagoa
14 th Group - Results expected in 2019											
Albatroz Laverna Aftershok Nova Terra	1652 5/8	MS Atlees SHT Aftershock-ET	Lama Preta Laverna Rajkot	AA	AB	AK	TL	TD	TV	TC	ABS Pecplan
Axxor Avalon RPM da Santo Antônio	1734 5/8	Farnear- TBR Altaavalon-ET	Geleia Sansão RPM Santo Antonio	AB	AA	AK	TL	TD	TV	TT	Alta Genetics
Barreto Masky Felicia Fausto FIV	3841-H PS	Fausto Polo Itauna	Felicia Riberao Grande TE	AA	BB	AK	TL	TD	TV	TT	Semex
Bond Choral Felicidade	7000-J 5/8	Emerald-ACE-VA Choral ET	Lama Preta Nuvem Meteoro	AB	AA	AK	TL	TD	TV	TT	Alta Genetics
Brazão Bixia Toystory Nova Terra	1105 3/4	Jenny-LOU Marshall Toystory-ET	Engenho da Rainha Bixia	AB	AA	AK	TL	TD	TV	TC	ABS Pecplan
Delegado Homestead FIV GRF M. Milagrosa	1800-D 3/4	Bomaz Homestead-ET	Calha Castelo Boa Fé	AB	AA	AK	TL	TD	TV	TC	ABS Pecplan
Diamante Valinhos	0040 OS	Fausto Polo Itauna	Imagem Valinhos	AA	BB	AK	TL	TD	TV	TC	Semex
Dionísio FR Recreio	9999-H PS	Tango Storm Renascer	Leopoldina FR Recreio	AB	AA	AK	TL	TD	TV	TT	CRI Genética
Galáctico 4365 Megaton NF Irmãos	3984-H 3/4	ShadyCrest-H Megaton-ET	Elegancia 4365 Gameta NF Irmãos	AB	AA	AK	TL	TD	CV	TT	ABS Pecplan
Gênio das Árbitas	8686-F 5/8	Bomaz Sht Kolton 692-ET	Semente das Árbitas	AA	AB	AK	TL	TD	TV	TT	CRI Genética
Golias Fausto da Mu Mu	0580-D PS	Fausto Polo Itauna	Dolores Dabliu da Mu mu	AA	BB	AK	TL	TD	TV	TT	Alta Genetics
Icaro Super RBR	1209 3/4	Charlesdale Superstition ET	Volga Bem Feitor RBR	AA	BB	AK	TL	TD	TV	TC	CRI Genética
Jacuba GM Kyoto Bem Feitor Planet	1769 5/8	Encenada Taboo Planet-ET	Jacuba I Bela I	AA	BB	AK	TL	TD	TV	TT	ABS Pecplan
Jagunço IV FIV Shottle Alegre	1733 5/8	Picston Shottle-ET	Colonia Sansão OG	AA	AB	AK	TL	TD	TV	TC	Alta Genetics
JPZ Calisto FBI Laranja FIV	1681 5/8	Gillette Brileia FBI	Laranja Santa Luzia	AA	BB	AK	TL	TD	TV	TC	Semex
Luti Florin Dom Nato	0580-G PS	Florin Marker Dom Nato	Rendeira Nica Millenium Boa Fé	AA	BB	AK	TL	TD	TV	TT	ABS Pecplan
Mark Fausto TE São Marcos	8080-I PS	Fausto Polo Itauna	363 Urik Vista Alegre	AA	BB	AK	TL	TD	TV	TC	Alta Genetics
Meteoro Florin JEBR	0039 PS	Florin Marker Dom Nato	Macieira JEBR	AA	AA	AK	TL	TD	TV	TC	Semex
Oludum Sadonana FIV	1170 3/4	Millenium Hortencia ALF Boa Fé	Kayene TE Sadonana	AB	BB	AK	TL	TD	TV	TC	ABS Pecplan
Quentao Planet FIV FZD	1187 5/8	Encenada Taboo Planet-ET	Parabolica Everest 3E	AB	BB	AK	TL	TD	TV	TC	CRI Genética
Rage Blitz da Garden S Buck	0911-E 3/4	Fustead Enory Blitz-ET	Maravilha Rolex Fela	AA	AB	AK	TL	TD	TV	TC	CRI Genética
Recanto da Baronesa Bonitão	8470-K PS	Fausto Polo Itauna	Liz Luke TE Mutum	AA	AA	AK	TL	TD	TV	TC	CRV Lagoa
Tesouro Dengo Toystory Itauna	1682 5/8	Jenny-LOU Marshall Toystory-ET	Dengosa 6 Nobre Itauna	AB	BB	AK	TL	TD	TV	TC	Sembrapa
15 th Group - Results expected in 2020											
Alado Blitz FIV JM Monte Alverne	1206	Fustead Enory Blitz-ET	Botique JM Monte Alverne	AA	AB	AK	TL	TD	TV	NG	CRV Lagoa
Alfy Cayuaba Impacto Kambly IV	0190	Impacto FIV da Prata JAC	Alfy Cayuaba Cacique Halina	AA	AA	AK	TL	TD	TV	NG	Alta Genetics
Caique Goldwyn FIV F. Congonhas	6827-P	Braedale Goldwyn	Neves da CA Boa Vista	AA	AB	AK	TL	TD	TV	NG	Alta Genetics
Capiu FIV Florin da Tropical	1010-M	Florin Marker Dom Nato	Celeste Durham Santa Luzia	AA	AA	AK	TL	TD	TV	NG	CRV Lagoa
Castelo de Uberaba Goldwyn Fube	7114-R	Braedale Goldwyn	Castanhola Herdeiro MAMJ	AA	AB	KK	TL	TD	TV	NG	Alta Genetics
Corel FIV Fausto da Tropical	1020-M	Fausto Polo Itauna	Rendeira Nica Millenium Boa Fe	AA	BB	AK	TL	TD	TV	NG	Alta Genetics

(Continued...)

(Continuation...)

Sire name	Reg.	Father	Mother	Molecular Markers ¹					Semen available - AI Company
				K-CV ²	B-LGB ³	DGAT 1 ⁴	BLAD ⁵	DUMPS ⁶	OPN ⁸
Dragao FIV Wildman da Tropical	1000-M	Lady's Manor Wildman-ET	Pianga Sansão OG	AA	BB	AK	TL	TD	NG
Ebalco Magnetim FIV da Medalha Milagrosa	6833-P	Mister Magnetism-ET	Lama Preta Opala Brilhante	AA	AB	AK	TL	TD	NG
Evoque Morty Gil Giv São Marcos	7120-R	Stouder Morty-ET	Gil São Marcos	NG	NG	NG	NG	NG	NG
Farrok FIV Corrego Branco	1232	Torpedo Bolton Santa Luzia	Mexerica Santa Luzia	AA	AB	AK	TL	TD	NG
Febo FR Recreio	6300-N	Stanbro More	Lapaz FR Recreio	AA	AA	AK	TL	TD	NG
Gronman FIV Blitz Santa Luzia	1795	Fustead Emory Blitz-ET	Castanhola Herdeiro MAMJ	AA	BB	AK	TL	TD	NG
Hugo Fever da Mumbu	6829-P	Crackholm Fever	Eureka I FIV Teatro Delib	AA	AA	KK	TL	TD	NG
ICH K85 Canela Shottle	4230-K	Picston Shottle-ET	ICH Canela Teatro	AA	AB	AK	TL	TD	NG
Jacuba Ping Impressor Freddie	1765	Badger Bluff Fanny Freddie	Jacuba I Brenda II	AB	AA	AK	TL	TD	NG
Jagunço VIII FIV Shottle Alegre	6839-P	Picston Shottle-ET	Colonia Sansão OG	AA	AA	AK	TL	TD	NG
Natan Mandel Dom Nato	8738-J	Lutz-Meadows e Mandel-ET	Gioconda Napolitano Dom Nato	AA	AB	AK	TL	TD	NG
Pierro FIV Morada Corinthiana	2386-Q	Impacto FIV da Prata JAC	Jalita Tutti Morada Corinthiana	AB	AB	AK	TL	TD	NG
Porto Real Da Terra Vermelha	1799-D	Picston Shottle-ET	Quartinha Terra Vermelha	AA	AA	AK	TL	TD	NG
Queops Planet FIV 3S FZD	1188	Ensenada Taboo Planet	Rainha Ouliate do Fazendão	AA	AA	AK	TL	TD	NG
Querubin FIV Terra Vermelha	2254-J	Mountfield Altaexacter	Lalia TE Terra Vermelha	AB	AB	AK	TL	TD	NG
RBC Farol Paramount FIV	2820-I	Delta Paramount	Laranja Santa Luzia	AA	AB	AK	TL	TD	NG
Templo Raro das Arabias II	0078	Raro das Arabias	Bailarina das Arabias	AA	AA	KK	TL	TD	NG
Vesúvio Avalon Itáuna	6836-P	Famear-TBR Altaavalon-ET	Norma Jarro de Ouro Itáuna	AA	AB	AK	TL	TD	NG
Vulcano Avalon Itáuna	6838-P	Famear-TBR Altaavalon-ET	Laranja Limogenes Itáuna	AB	AB	AK	TL	TD	NG

¹NG - Not genotyped, ²Allele A - High yield for cheese, Allele B - low yield for cheese. ³Allele A - High milk yield Allele B - High protein and fat milk content. ⁴Allele A - Increase in milk and protein production, Allele K - Reduction in milk protein content and increase in milk fat content. ⁵BL - Heterozygote animal - carrier of the allele for BLAD, TL - Homozygote animal - non-carrier of the allele for BLAD, ⁶DP - Heterozygote animal - carrier of the allele for DUMPS, TD - Homozygote animal - non-carrier of the allele for DUMPS. ⁷CV - Animal - Heterozygote animal - carrier of the allele for CVM, TV - Homozygote animal - non-carrier of the allele for CVM. ⁸Allele C - Associated to increased protein and fat milk content, Allele T - Associated to elevated weight gain.

Annex 2. Pedigree information of Girolando sires of the 2014 Report (Group 1 to 10), ordered by general ranking classification.

Clas.	Group	Reg.	Sire	Father	Mother	Paternal Grandfather	Maternal Grandfather	Owner
1	7	983 5/8	Tango Storm Renascer	Mi-Bren Mathie Storm	Morena Renascer	Paradise-r Cleitus Mathie	N/D*	João Dário Ribeiro
2	10	1248 5/8	Impacto FIV da Prata JAC	Clintia Zack Frederick-ET	Harmonia Terra Vermelha	Chance Southwind LB Zack-ET	CA Quero-quero	José Antônio da Silva Clemente
3	10	806 3/4	Luter King TE Terra Vermelha	Regencrest Elton Durham-ET	Quartinha Terra Vermelha	Emprise Bel Elton	Red-Fever Oakland-ET	Marta de Azevedo Bernardes
4	8	780 3/4	Argue Leduc Santa Luccia TE	Lystel Leduc-ET	Iracema LE	Juniper Rotate Jed-ET	Lonte Blackstar Jewel TL	Condomínio JPZ Jorge Papazoglu e outro
5	5	621 5/8	Kaen Celsius Itaina	528 Etazon Celsius-ET	Emboaba Everest Itaina	How-EL Acres K Bellman-ET	C. A. Everest	Valério Machado Guimarães
6	8	684 5/8	Nicolau Fausto Itaina	Fausto Polo Itaina	Java Gaiato Itaina	B-Hiddenhills Mark-O Polo TL	Gaiato Mason Itaina	Valério Machado Guimarães
7	4	717 5/8	Fausto Polo Itaina	B-Hiddenhills Mark-O Polo	Bolacha Oásis Itaina	Walkway Chief Mark	Santa Cruz Oásis Hâbil	Valério Machado Guimarães
8	6	931 5/8	Lion Império Itaina	Império Paviljon Itaina	Gama TE Mason Itaina	Etazon Paviljon	Shoremar Mason-ET	Valério Machado Guimarães
9	9	1154 5/8	Jacuba Titânio Bem Feitor Celsius	Jacuba Titânio Bem Feitor Celsius	Jacuba I Novena I	How-EL Acres K Bellman-ET	Bem Feitor Raposo da Cal	Roberto Pimentel de Mesquita
10	6	945 5/8	Turbante Touch das Árábias	Dinomi Melwood Touch TL	Maravilha das Árábias	Arlinda Melwood-ET	N/D*	Ricardo Mizziara Jreige
11	10	917 3/4	Abdu Lord Lily Santa Luz	Etazon Lord Lily-ET	Independência Santa Luzia	To-Mar Blackstar-ET	N/D*	José Coelho Vitor
12	9	0016 PS	Notebook das Três Passagens	Magical Mascot TE Rancho Alegre	Favela Feitico das Três Passagens	Singing-Brook-B Mascot - ET	Feitico das Primaveras	Ricardo Catão Ribeiro
13	8	754 3/4	Diamante Billy da Cacá	110 Billy Fancy Paul Y	Lira Boogy da Cacá	Utag Valiant Fancy Paul-ET	Sherryhill Cubby Boogy-ET	José Mascarenhas T.Jr/Cassio R.B.Paiva
14	8	1065 5/8	Ocidente London do Morro	Londondale Lman Magnum-ET	Sevilha Ocidente do Morro	Rothrock Tradition Leadman	Ocidente	Olavo de Resende Barros Júnior
15	5	734 5/8	Cowboy Addison TE Rancho Alegre	Etazon Addison-ET	Mágica Rancho Alegre	Bis-May E.L Mountain-ET	Beguaba Gil	Hilton da Cunha Peixoto
16	1	300 3/4	110 Billy Fancy Paul Y	Utag Valiant Fancy Paul-ET	Panorama IV	SWD Valiant	N/D*	Renato da Cunha Oliveira
17	4	541 3/4	MBF 0246	Etazon Wallace	MBF Redação	Singing-Brook N-B Mascot-ET	Clover Mist Dandana-ET	Maria Dias Barretto Figueiredo
18	7	880 5/8	Átila Ira da Cacá	Irá Urutu do Morro	Andorinha Spacey da Cacá	Santa Cruz Urutu Relógio	N/D*	João Augusto Junqueira Reis
19	2	454 5/8	Magical Mascot TE Rancho Alegre	S Brook N-B Mascot-ET	Mágica Rancho Alegre	Whittier-Farms Ned Boy	Beguaba Gil	Hilton da Cunha Peixoto
20	5	580 3/4	Aristóteles Grandslam TE Sta Luccia	J-L-G Grandslam-ET	Iracema LE	Exrango Thor	Lonte Blackstar Jewel	Jorge Papazoglu
21	3	475 3/4	Millenium Hortência Alf Boa Fé	Alvor Elton Alf	Hortência Boa Fé	Emprise Bell Elton	N/D*	Agropecuária Boa Fé Ltda
22	8	955 5/8	Indio Windstar Sertão	Dupasquier Windstar	Angra Sertão	Duregal Astre Starbuck ET	N/D*	Nazareth Dias Pereira
23	9	0007 PS	Neon das Três Passagens	Famoso das Três Passagens	Jandira das Três Passagens	Curimatã das Três Passagens	Caxi OG	Olavo de Resende Barros Júnior
24	7	555 5/8	Simbolo Swinger Cal	Delta Swinger-ET	Diadema Cal	528 Etazon Celsius-ET	N/D*	Olavo de Resende Barros
25	9	1167 5/8	Globo Billy JAC	110 Billy Fancy Paul Y	Gemada Decal II JAC	Utag Valiant Fancy Paul-ET	Riclar Enchantin Decal	Jair Alves Camargos/José Alves Camargos
26	7	997 5/8	Curimã III TE Alegre	Curimatã das Três Passagens	Arita Vertente	Twist Astronaut	Richlawn Simon Dustin	Nelson Ariza
27	9	855 3/4	Garimpo Boss JGVA	Bossidae Ruben-ET	Fineza Urânio JGVA	Ked Juror-ET	Urânio TE da Silvânia	José Geraldo Vaz Almeida
28	1	215 5/8	Santa Cruz Zape Elevation	Três Irmãos Elevation	Idade MEF Santa Cruz	Round Oak Rag Aple Elevation	Maravilha Exponente Faizão	José João Salgado dos Reis
29	4	639 5/8	Brutus das Árábias	Santa Cruz Zinabre Dynamic	Bailarina das Árábias	Caernavon Rotate Dynamic	Petticote Boda-ET	Ricardo Mizziara Jreige
30	2	455 5/8	Maguito Mascot TE Rancho Alegre	S Brook N-B Mascot-ET	Mágica Rancho Alegre	Whittier-Farms Ned Boy	Beguaba Gil	Hilton da Cunha Peixoto
31	3	667 5/8	Zimbo das Árábias	Santa Cruz Zimbo Elevation	Bailarina das Árábias	Três Irmãos Elevation	Petticote Boda-ET	Ricardo Mizziara Jreige
32	5	781 5/8	Rincão Itaipu Y	Itaipu Nobre Y	Beleza Y	Nobre Fancy Paul Y	N/D*	Renato da Cunha Oliveira
33	6	885 5/8	Jaguar das Três Passagens	Famoso das Três Passagens	Gata das Três Passagens	Curimatã das Três Passagens	J-L-G Grandslam-ET	Carlos Eduardo Ferreira
34	7	636 3/4	RBC Redator	Regencrest RBK Die-hard-ET	RBC Parainífa	Paradise-r Roebuck	N/D*	Roberto Antônio Pinto Melo de Carvalho
35	7	1039 5/8	Florin Marker Dom Nato	528 Southland Marker-ET	Famosa Oliveira	Singing-Brook N-B Mascot-ET	N/D*	José Donato Dias Filho
36	6	864 5/8	Império das Três Passagens	Dedé Três Passagens	Cocaina Três Passagens	Twist Astronaut	Bis-May Tradition Cleitus	Carlos Eduardo Ferreira
37	6	928 5/8	Soberano Adonias Santa Luccia	Adonias Progress Santa Luccia TE	Ametista Caju Santa Luccia TE	Duncan Progress-ET	Caju de Brasília	Jorge Papazoglu
38	6	871 5/8	Lama Preta Hércules Twist-TE	Twist Astronaut	Cocaina Três Passagens	Flamengo da GB	Bis-May Tradition Cleitus	Arpaador Agrop. Prom. Ltda.
39	2	452 5/8	Damão Bellwood 3E	Maizefield Bellwood	Maravilha 3E	Arlinda Melwood-ET	N/D*	Antônio de Souza Salgueiro
40	9	797 5/8	Netuno Famoso Dona Beja	Famoso das Três Passagens	363 Urík Vista Alegre	Curimatã das Três Passagens	Jatoba Urík Persistent Rima	Rubens Belchior da Cunha
41	5	657 5/8	Feiticeiro Riacho da Serra	Ked Juror-ET	Cajúna Riacho da Serra	To-Mar Blackstar	N/D*	Ávaro Vasconcelos/Marcos Costa
42	3	476 3/4	Estand Luke HB	Norrelake Cleitus Luke	Chaleira HB	Bis-May Tradition	N/D*	Hélio Borges Barbosa
43	8	1066 5/8	Milagre das Três Passagens	Império Paviljon Itaina	Goiabada das Três Passagens	Etazon Paviljon	Petticote Lance TL	Marco Paulo Lemos Ferreira
44	4	680 5/8	Famoso das Três Passagens	Curimatã das Três Passagens	Curimatã das Três Passagens	Twist Astronaut	B-Hiddenhills Mark-O Polo	Carlos Eduardo Ferreira
45	8	999 5/8	Curimã I TE Alegre	Curimatã das Três Passagens	Arita Vertente	Twist Astronaut	Richlawn Simon Dustin	Nelson Ariza
46	4	470 5/8	Galã Fancy Paul Itaina TE	Utag Valiant Fancy Paul-ET	Mansinha Itaina	SWD Valiant	Santa Cruz Oriente Morcego	José Henrique Pastore
47	4	500 3/4	Chaplin Billy Fancy Paul Y	110 Billy Fancy Paul Y	Cancela Y	Utag Valiant Fancy Paul-ET	SS Juazeiro Berlin	Renato da Cunha Oliveira

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(Continuation...)

Clas.	Group	Reg.	Sire	Father	Mother	Paternal Grandfather	Maternal Grandfather	Owner
48	1	350 5/8	Doutor Bellringer Itaúna	Tiho Bellringer-ET	Mansinha Itaúna	Carlin-M Ivanhoe Bell	Santa Cruz Oriente Morcego	RYG Emp. Part. e Adm. S/A
49	6	563 3/4	Executivo Billy Beleza Y TE	110 Billy Fancy Paul Y	Beleza Haden CF	Uttag Valiant Fancy Paul-ET	N/D*	Renato da Cunha Oliveira
50	1	243 5/8	Dileto Bathazar Sonho	Conductor Bathazar	Azurita FR	Wapa Arlina Conductor	N/D*	Mário Lúcio Barros Borges
51	9	1204 5/8	Dillon Ito das Arábias	Barbee-M Juror Ito-ET	Semente das Arábias	Ked Juror-ET	Caju de Brasília	Maria Beatriz Costa Gomes
52	8	632 3/4	Talento Millennium Boa Fé	Millenium Hortência Alf Boa Fé	Lancha Agrauna Booster Boa Fé	Alvoor Eton Alf	Fustead Tesk Booster-ET	Enos Toledo Yan Hsin Ma
53	1	200 5/8	Azoto da Ouro Verde	Caldas Supremo TE	Araponga da Ouro Verde	Pawnee Farm Arlinda Chief	N/D*	Francisco Geraldo Megale
54	1	216 5/8	Santa Cruz Zinabre Dynamic	Caernavon Rotarte Dynamic	Reliquia Oásis Santa Cruz	Arlinda Rotarte	Santa Cruz Oásis Hábil	José João Salgado dos Reis
55	3	345 5/8	Caxi OG	Fetico das Primavera	Montanha da OG	Combo Criss	N/D*	Vilmar Pereira Pires
56	5	619 5/8	Garboso Curimatã das Três Passagens	Curimatã das Três Passagens	Cereja das Três Passagens	Twist Astronaut	Lee-Gin Chris Bell	Bráulio Conti Júnior
57	2	487 5/8	Baco das Arábias	Lutz Meadows Blackstar Miles	Gemada das Arábias	To-Mar Blackstar	N/D*	Ricardo Miziara Jreige
58	2	366 3/4	Nautilus Bandit Rancharia	Hanoverhill Bandit-ET	Sapeca Astro M-4	Rockallf Son of Bova	Capucho da Camig	Aldir Henrique Silva
59	2	410 5/8	Curimatã das Três Passagens	Twist Astronaut	Belaliba Sonho	Flamengo da GB	GRF Máximo Twin Chief	Carlos Eduardo Ferreira
60	9	0014 PS	RBC Singelo	Curimatã Três Passagens	RBC Proveta	Curimatã das Três Passagens	Oitavo Reiro da Barra	Roberto Antônio P. Melo Carvalho
61	9	973 5/8	Ébano Gordon da Limeira	Dellka Juror Gordon	2244 Matoso HG	Ked Juror-ET	Reinador da Epanig	José Márcio de Simone Silveira
62	3	479 5/8	Dedé Três Passagens	Twist Astronaut	Ativa das Três Passagens	Flamengo da GB	Mainsteam Hotshot	Carlos Eduardo Ferreira
63	5	566 3/4	Escote Royalist Curral Velho	Startmore Royalist-ET	Malvina Curral Velho	Madawaska Aerostar	N/D*	Renildo Neides Alves
64	7	752 5/8	Lama Preta Instrutor Cavalier	Ca-Lili Standout Cavalier	Fartura OG	Sunnyside Standout	Mongol da Pontal	Arpoador Agropecuária e Promoções Ltda.
65	3	604 5/8	Império Paviljon Itaúna	Erazon Paviljon	Bolacha Oásis Itaúna	To-Mar Wister-ET	Santa Cruz Oásis Hábil	RYG Emp. Part. e Adm. S/A
66	2	333 3/4	Senador S.W.D. Santa Isabel	SWD Valiant	Miss da GB	Pawnee Farm Arlinda Chief	N/D*	José de Freitas Anaral
67	2	312 3/4	BR Granito Mandingo TE	Fisher Place Mandingo Twin	Fortaleza BR	SWD Valiant	N/D*	Bruno Regis Borges da Costa
68	8	1075 5/8	Vilão TE Alegre	Caxi OG	Ambição Lindy Beata	Fetico das Primavera	Minerão Lindy Roma TE	Nelson Ariza
69	7	599 5/8	Batila Irá da Cacá	Irá Urutu do Morro	Andorinha Spacey da Cacá	Santa Cruz Urutu Relógio	N/D*	José Mascarenhas Torres Junior

*N/D - Not determined.

Annex 3. Girolando Breed Genetic Improvement Program Participating Herds.

Herd / Farm	City	State
Fazenda Alto Verde	Maceió	AL
Fazenda Belo Horizonte	Amargosa	BA
Fazenda Bonanza	Cachoeira	BA
Fazenda Córrego Raso	Candeias	BA
Fazenda Beira Rio	Rafael Jambeiro	BA
Fazenda Mangueira	Apiacá	ES
Fazenda Dourada	Barra de São Francisco	ES
Fazenda Santa Cruz	Barra de São Francisco	ES
Fazenda Vovô Mel	Barra de São Francisco	ES
Sítio Fagundes	Barra de São Francisco	ES
Sítio Paiva	Barra de São Francisco	ES
Sítio Silva	Barra de São Francisco	ES
Fazenda Pedra Branca	Cachoeira do Itapemirim	ES
Sítio Córrego Azul	Divino de São Lourenço	ES
Fazenda Capel	Ecoporanga	ES
Fazenda Colibrí	Ecoporanga	ES
Fazenda Estrela	Ecoporanga	ES
Fazenda Fortaleza	Ecoporanga	ES
Fazenda J. F.	Ecoporanga	ES
Fazenda Naná	Ecoporanga	ES
Fazenda Palmeira	Ecoporanga	ES
Fazenda Primavera	Ecoporanga	ES
Fazenda Primavera	Ecoporanga	ES
Fazenda São Paulo	Ecoporanga	ES
Fazenda Sayonara	Ecoporanga	ES
Fazenda Vista Alegre	Ecoporanga	ES
Fazenda Vista Alegre	Ecoporanga	ES
Sítio Boa Esperança	Ecoporanga	ES
Sítio do Sândalo	Ecoporanga	ES
Sítio Dois Irmãos	Ecoporanga	ES
Sítio Senhor do Bonfim	Ecoporanga	ES
Sítio Três Irmãos	Ecoporanga	ES
Fazenda Água limpa	Ibitirama	ES
Fazenda Várzea	Ibitirama	ES
Fazenda São Joaquim	Mimoso do Sul	ES
Fazendas Reunidas VB Ltda.	Mimoso do Sul	ES
Fazenda Mato Grosso	São Pedro de Rati	ES
Fazenda Cachoeira Comprida	Vila Velha	ES
Fazenda Shangrilá	Abadia de Goiás	GO
Fazenda Ribeirão das Paulas	Cachoeira Alta	GO
Fazenda Baú	Caçu	GO
Fazenda Baú	Caçú	GO
Caldas Novas	Caldas Novas	GO
Fazenda Vitória	Edeia	GO
Fazenda Nossa Senhora de Fátima	Ipameri	GO
Chacara Nova Esperança	Itarumã	GO
Fazenda Barreiro	Itarumã	GO
Fazenda Baú	Itarumã	GO
Fazenda Cabrito	Itarumã	GO
Fazenda Felicidade	Itarumã	GO
Fazenda Ribeirão do Meio	Itarumã	GO
Fazenda Ribeirão do Meio	Itarumã	GO
Fazenda Rio Solar	Itarumã	GO
Fazenda São Pedro	Itarumã	GO
Fazenda Serrinha I	Itarumã	GO

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(Continuation...)

Herd / Farm	City	State
Fazenda Boa Vista do Rio Claro	Jataí	GO
Fazenda Bom Jardim	Jataí	GO
Fazenda Braz Filizzola	Jataí	GO
Fazenda Lagoa	Jataí	GO
Fazenda Ponte Alta	Jataí	GO
Fazenda Rio Verde	Jataí	GO
Fazenda Santa Rosa do Rochedo	Jataí	GO
Fazenda São Domingos	Luziânia	GO
Fazenda Bom Jardim	Morrinhos	GO
Fazenda São Caetano	Morrinhos	GO
Fazenda Cachoeira	Ourizona	GO
Fazenda Cachoeira	Ourizona	GO
Fazenda Mamão	Padre Bernardo	GO
Fazenda Salto	Padre Bernardo	GO
Fazenda Bauzinho	Pires do Rio	GO
Fazenda Fonte do Saber	Rio Verde	GO
Fazenda Rio Preto	Rio Verde	GO
Núcleo Regional Arroz e Feijão	Santo Antônio de Goiás	GO
Fazenda Boa Vista	Abaeté	MG
Fazenda Corrego Grande	Araxá	MG
Fazenda Boa Vista	Arcos	MG
Fazenda Boa Vista	Arcos	MG
Fazenda Capoeira do Café	Arcos	MG
Fazenda Cristais	Arcos	MG
Fazenda Reserva	Arcos	MG
Fazenda São Domingos	Arcos	MG
Fazenda São Domingos	Arcos	MG
Fazenda São Domingos dos Carneiros	Arcos	MG
Fazenda Sobradinho/Capoeirão	Arcos	MG
Fazenda Varjão	Arcos	MG
Fazenda Varginha	BambuÍ	MG
Fazenda Varginha	BambuÍ	MG
Sítio Morro Redondo	Barão de Monte Alto	MG
Sítio Sapeca	Barão de Monte Alto	MG
Fazenda San Francisco	Belo Horizonte	MG
Fazenda Caiçara	Biquinhas	MG
Fazenda Pedra do Urubú	Bom Sucesso	MG
Fazenda São Geraldo	Bom Sucesso	MG
Fazenda São Sebastião	Bom Sucesso	MG
Fazenda Zeringota	Bom Sucesso	MG
Fazenda Terra Alegre	Brasilândia de Minas	MG
Fazenda Santo Inácio	Campo Florido	MG
Fazenda Santo Inácio I	Campo Florido	MG
Sítio Três Lagoas	Campo Florido	MG
Fazenda General	Carangola	MG
Fazenda Boa Vista	Carvalhos	MG
Fazenda Cantaduvás	Carvalhos	MG
Fazenda Oliveira	Carvalhos	MG
Fazenda Araponga	Cássia	MG
Fazenda Barra da Cachoeira	Cássia	MG
Fazenda Bonfim	Cássia	MG
Fazenda Formiga	Cássia	MG
Fazenda Guanabara	Cássia	MG
Fazenda Retiro da Barra	Cássia	MG
Fazenda Retiro da Ponte	Cássia	MG

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Herd / Farm	City	State
Fazenda Santa Inês	Cássia	MG
Fazenda Santa Tereza	Cássia	MG
Fazenda Boa Fé	Conquista	MG
Fazenda Coqueiros	Conquista	MG
Fazenda Nova Terra	Conquista	MG
Fazenda Mãe Não Me Chore	Coronel Xavier Chaves	MG
Fazenda Agua Benta	Córrego Danta	MG
Fazenda Angolinha	Córrego Danta	MG
Fazenda Boa Esperança I	Córrego Danta	MG
Fazenda Boa Esperança II	Córrego Danta	MG
Fazenda Cancã	Corrego Danta	MG
Fazenda Corrego Danta	Córrego Danta	MG
Fazenda Jatobá	Córrego Danta	MG
Fazenda Limoeiro	Córrego Danta	MG
Fazenda Limoeiro Olhos D'Agua	Córrego Danta	MG
Fazenda Paraíso	Córrego Danta	MG
Fazenda Tetais	Córrego Danta	MG
Fazenda Tetais	Córrego Danta	MG
Fazenda Tetais	Córrego Danta	MG
Fazenda Tetais II	Córrego Danta	MG
Fazenda Vereda	Córrego Danta	MG
Fazenda Vereda	Córrego Danta	MG
Sítio da Cotia	Córrego Danta	MG
Fazenda Santiago	Córrego Danta	MG
Sítio do Atalho	Delfinópolis	MG
Fazenda Nossa Sra de Fátima	Delta	MG
Fazenda Boa Sorte	Divino	MG
Fazenda Recanto	Divino das Laranjeiras	MG
Sítio das Flores	Divino das Laranjeiras	MG
Fazenda Ribeirão de Estiva	Estiva	MG
Fazenda São João / Ribeirão das Pedras	Estiva	MG
Sítio da Toca	Estiva	MG
Sítio São Jorge - Itaim	Estiva	MG
Sítio São José - Pantano das Rosas	Estiva	MG
Sítio Sertãozinho	Estiva	MG
Sítio Sertãozinho	Estiva	MG
Sítio Cap. Antônio Juventino de Moura	Extrema	MG
Sítio dos Limas	Extrema	MG
Sítio Fátima	Extrema	MG
Sítio N. Senhora de Fátima	Extrema	MG
Sítio São Benedito	Extrema	MG
Sítio São Carlos	Extrema	MG
Sítio São José	Extrema	MG
Sítio São Pedro	Extrema	MG
Fazenda Escola	Florestal	MG
Fazenda Albertos	Formiga	MG
Fazenda Baiões de Baixo	Formiga	MG
Fazenda Boa Esperança	Formiga	MG
Fazenda do Alto	Formiga	MG
Fazenda Garcias - Gonçalves	Formiga	MG
Fazenda Gonçalves	Formiga	MG
Fazenda Mamona	Formiga	MG
Fazenda Morro Cavado	Formiga	MG
Sítio Beira Córrego	Formiga	MG
Fazenda Mato Preto	Frutal	MG

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Herd / Farm	City	State
Agrop. Novo Horizonte	Guarani	MG
Fazenda Boa Vista da Estiva	Guarani	MG
Sítio Grota da Nascente	Guarani	MG
Fazenda Sítio Velho	Ibia	MG
Fazenda Retiro Velho	Ibiá	MG
Fazenda Nova Era	Ibirací	MG
Fazenda Patrimônio	Igaratinga	MG
Fazenda Pedrinha	Iguatama	MG
Fazenda do Curtume	Inhaúma	MG
Fazenda Figueira	Ipanema	MG
Fazenda Limoeiro	Ipanema	MG
Fazenda Fundão	Ipiaçu	MG
Fazenda Engenho	Itaúna	MG
Fazenda Córrego do Açude	Ituiutaba	MG
Fazenda Felicidade	Ituiutaba	MG
Fazenda Maiara	Ituiutaba	MG
Fazenda Olhos D'água	Ituiutaba	MG
Fazenda São Sebastião	Ituiutaba	MG
Fazenda Hott	Lajinha	MG
Rancho Indaiá	Lajinha	MG
Estância Leblou	Leandro Ferreira	MG
Fazenda Estiva/Renacer	Luz	MG
Fazenda Campo Alegre	Matinho Campos	MG
Fazenda Alegria	Miradouro	MG
Fazenda Valinhos	Monte Alegre de Minas	MG
Fazenda Ouvidor	Monte Sto de Minas	MG
Fazenda Santos Reis	Monte Sto de Minas	MG
Sítio Flamboyant	Monte Sto de Minas	MG
Fazenda Boa Sorte	Muriaé	MG
Fazenda Campo Formoso	Muriaé	MG
Fazenda Gameleira	Muriaé	MG
Fazenda Monte Libano	Mutum	MG
Fazenda Varginha	Nova Ponte	MG
Fazenda Saudade	Novo Cruzeiro	MG
Fazenda da Lagoa	Oliveira	MG
Fazenda Dona Tita	Oliveira	MG
Fazenda Esteio	Oliveira	MG
Fazenda Morro da Mandioca	Oliveira	MG
Fazenda Rancho da Paz	Oliveira	MG
Fazenda Taquara Preta	Paiva	MG
Fazenda Rancho Grande	Pará de Minas	MG
Fazenda Santa Izabel	Paraopeba	MG
Haras Ponta Negra	Paraopeba	MG
Fazenda Limeira	Passos	MG
Fazenda Marinheiro	Passos	MG
Fazenda Santa Luzia	Passos	MG
Fazenda Primavera	Pequi	MG
Fazenda Cristal Branco	Perdões	MG
Fazenda Engenho	Perdões	MG
Fazenda do Serrote	Piau	MG
Fazenda Santa Rita da Boa Vista	Piranga	MG
Fazenda Santo Inácio	Planura	MG
Fazenda Esperança	Prata	MG
Fazenda Lagoa Dourada	Prata	MG
Fazenda Medalha Milagrosa	Prata	MG

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Herd / Farm	City	State
Fazenda Palmeirinha	Prata	MG
Fazenda Nossa Senhora Aparecida	Resende Costa	MG
Instituto Federal Sudeste MG - Campus Rio Pomba	Rio Pomba	MG
Fazenda Bom Retiro	Rio Preto	MG
Fazenda da Fulôre	Ritópolis	MG
Fazenda Segredo	Ritópolis	MG
Fazenda Santo Antonio	Sabinópolis	MG
Fazenda São João de Guanhões	Sabinópolis	MG
Sítio Voswaldo	Sabinópolis	MG
Fazenda Santa Bárbara	Sacramento	MG
Fazenda São Miguel	Santa Bárbara do Monte verde	MG
Fazenda Bela Fama	Santana do Manhuaçu	MG
Fazenda Prudenciana	São Gotardo	MG
Fazenda Capão	São Pedro do Suaçuí	MG
Fazenda Dallas	São Pedro do Suaçuí	MG
Fazenda Pau da Bandeira	São Tiago	MG
Fazenda São Sebastião	São Tiago	MG
Fazenda Taquaril	São Tiago	MG
Fazenda Coqueiros	São Tomas de Aquino	MG
Fazenda Bom Jardim	São Vicente de Minas	MG
Fazenda Engenho de Serra	São Vicente de Minas	MG
Sítio Nossa Senhora Aparecida	Toledo	MG
Fazenda Cascata	Tombos	MG
Fazenda 4 de Novembro	Tumiritinga	MG
Fazenda Cedro do Campo	Uberaba	MG
Fazenda Escola	Uberaba	MG
Fazenda Matinha	Uberaba	MG
Fazenda Palo Alto da Sta Gertrudis	Uberaba	MG
Fazenda Santa Rosa	Uberaba	MG
Fazenda Serra Morena	Uberaba	MG
Fazenda dos Machados	Uberlândia	MG
Sítio Nova Aurora	Uberlândia	MG
Fazenda Morada Corinthiana	Uberlândia	MG
Fazenda Santa Terezinha	Uberlândia	MG
Fazenda Estância JR	Veríssimo	MG
Fazenda Pedra Branca	Volta Grande	MG
Estancia MR	Anastácio	MS
Fazenda Fazendão	Campo Grande	MS
Fazenda São Marcos	Costa Rica	MS
Fazenda São Marcos	Costa Rica	MS
Fazenda Vale da Rondinela	Jaraguari	MS
Fazenda Belas Artes	Rio Brilhante	MS
Fazenda São Marcos	São Gabriel d'Oeste	MS
Fazenda Agua Limpa	Terenos	MS
Fazenda Cachoeirinha	Terenos	MS
Fazenda Estância Grasiela	Castanheira	MT
Fazenda Piracicabana	Castanheira	MT
Sítio 3 Irmãos	Castanheira	MT
Sítio Pingo de Mel	Castanheira	MT
Sítio Santa Lucia	Castanheira	MT
Sítio Tigre	Castanheira	MT
Sítio Três Corações	Castanheira	MT
Fazenda Dona Zita	Cláudia	MT
Sítio Amaral	Cláudia	MT
Sítio São João 100	Cláudia	MT

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Herd / Farm	City	State
Estancia Mirante da Serra	Guarantã do Norte	MT
Estancia Penápolis	Guarantã do Norte	MT
Estancia Vale da Serra	Guarantã do Norte	MT
Fazenda Pirassununga	Guarantã do Norte	MT
Sítio Buriti	Guarantã do Norte	MT
Sítio Cössia	Guarantã do Norte	MT
Sítio dos Lagos	Guarantã do Norte	MT
Sítio Ouro Branco	Guarantã do Norte	MT
Sítio Planalto	Guarantã do Norte	MT
Sítio Por do Sol	Guarantã do Norte	MT
Sítio Salem	Guarantã do Norte	MT
Sítio Santa Inês	Guarantã do Norte	MT
Sítio São Lourenço	Guarantã do Norte	MT
Sítio São Luis	Guarantã do Norte	MT
Sítio Sonho de Criança	Guarantã do Norte	MT
Sítio Três Irmãos	Guarantã do Norte	MT
Fazenda Patos de Minas	Juína	MT
Fazenda Restia do Sol	Juína	MT
Fazenda Vista Alegre	Juína	MT
Sítio Santa Rita	Juína	MT
Sítio São José	Juína	MT
Estância Nossa Senhora Aparecida	Mirassol D' Oeste	MT
Estância Nossa Senhora Aparecida	Mirassol D' Oeste	MT
Sítio 3 Palmeiras	Mirassol D' Oeste	MT
Sítio Agua Doce	Mirassol D' Oeste	MT
Sítio Castelo Branco	Mirassol D' Oeste	MT
Sítio Coração de Jesus	Mirassol D' Oeste	MT
Sítio Estrela Guia	Mirassol D' Oeste	MT
Sítio Flor do Campo	Mirassol D' Oeste	MT
Sítio Morada da Serra	Mirassol D' Oeste	MT
Sítio Nossa Senhora Aparecida	Mirassol D' Oeste	MT
Sítio Nossa Senhora de Fátima	Mirassol D' Oeste	MT
Sítio Paraíso da Serra	Mirassol D' Oeste	MT
Sítio Santa Luzia	Mirassol D' Oeste	MT
Sítio Santo Antônio	Mirassol D' Oeste	MT
Sítio São Benedito	Mirassol D' Oeste	MT
Sítio Sol Nascente	Mirassol D' Oeste	MT
Fazenda Nossa Senhora de Fátima	Nova Canaã do Norte	MT
Sítio Perin	Nova Guarita	MT
Sítio Pimentel	Nova Santa Helena	MT
Sítio Carvalho	Novo Mundo	MT
Sítio Novo Horizonte	Novo Mundo	MT
Sítio União	Novo Mundo	MT
Sítio Elielda	Peixoto de Azevedo	MT
Fazenda Kata	Terra Nova do Norte	MT
Fazenda Onça Parda	Terra Nova do Norte	MT
Fazenda Por do Sol	Terra Nova do Norte	MT
Miraguai	Terra Nova do Norte	MT
Sítio Água Branca	Terra Nova do Norte	MT
Sítio Alvorada	Terra Nova do Norte	MT
Sítio Apucarana	Terra Nova do Norte	MT
Sítio Cajueiro	Terra Nova do Norte	MT
Sítio da Serra	Terra Nova do Norte	MT
Sítio Lorenzini	Terra Nova do Norte	MT
Sítio Machado	Terra Nova do Norte	MT

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(Continuation...)

Herd / Farm	City	State
Sítio Nossa Senhora Aparecida	Terra Nova do Norte	MT
Sítio Novo Mundo I	Terra Nova do Norte	MT
Sítio Paraíso	Terra Nova do Norte	MT
Sítio São Roque	Terra Nova do Norte	MT
Sítio São Roque	Terra Nova do Norte	MT
Sítio Zanovello	Terra Nova do Norte	MT
Fazenda Botija	Guarabira	PB
Fazenda Lagoa do Cassiano	Bom Conselho	PE
Fazenda Apoá do Rio	Lagoa do Carro	PE
Fazenda Catolé	Pesqueira	PE
Fazenda São Sebastião	Pesqueira	PE
Estação Arco Verde	Recife	PE
Fazenda Aimalta	Recife	PE
Fazenda Mirin do Vale	Recife	PE
Fazenda Uberaba	Recife	PE
Fazenda Zombaria	Recife	PE
Estância Água Amarela	Chopinzinho	PR
Estância dos Araças	Chopinzinho	PR
Fazenda Boshi	Chopinzinho	PR
Fazenda Iguaporã	Chopinzinho	PR
Sítio 3 Pinheiros	Chopinzinho	PR
Sítio Chopim	Chopinzinho	PR
Sítio Sete Arroio	Chopinzinho	PR
Sítio Bom Retiro	Colorado	PR
Sítio Santa Rita	Colorado	PR
Sítio Santo Antônio	Colorado	PR
Sítio São João	Colorado	PR
Sítio São José	Colorado	PR
Rancho do Bom Jesus	Guaraci	PR
Estância Três Irmãos	Jaguapitã	PR
Sítio Santa Maria	Jaguapitã	PR
Sítio Sto Antônio	Lobato	PR
Estancia Santa Maria	Maringá	PR
Sítio Carvalho	Santo Inácio	PR
Sítio Menino Jesus	Santo Inácio	PR
Sítio Oliveira	Santo Inácio	PR
Fazenda Mello	Conceição de Macabu	RJ
Fazenda Joana Darc	Miguel Pereira	RJ
Fazenda São Roque	Miguel Pereira	RJ
Fazenda Monte Alto	Natividade	RJ
Fazenda do Banco	Porciuncula	RJ
Fazenda Recreio	São José de Ubá	RJ
Fazenda Prosperidade	Valença	RJ
Fazenda São Luiz velho	Valença	RJ
São José da Cachoeira	Valença	RJ
Sítio Guimarães	Valença	RJ
Sítio São José	Valença	RJ
Fazenda São Luis	Taipu	RN
Fazenda Retiro da Esperança	Altair	SP
Fazenda São Pedro São Paulo	Arandu	SP
Sítio Recanto Sol e Lua	Estiva Gerbi	SP
Estância Sto Antônio	Guapiaçu	SP
Estancia Paraíso	Itapetininga	SP
Escola Agrícola	Jacareí	SP
Fazenda Santo Antônio	José Bonifácio	SP

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(Continuation...)

Herd / Farm	City	State
Chácara Senna	Junqueirópolis	SP
Sítio Santo Antonio	Lavrinhas	SP
Fazenda Santana	Lins	SP
Fazenda Boiada	Mococa	SP
Sítio São Sebastião	Mococa	SP
Sítio Beira Rio	Mogi das Cruzes	SP
Estância Paineiras	Nova Granada	SP
Estância Bela Vista	Orindiuva	SP
Estância Sete Estrela	Orindiuva	SP
Fazenda Bacuri	Orindiuva	SP
Fazenda Barreirão	Orindiuva	SP
Fazenda Do Espírito Santo	Paraibuna	SP
Fazenda Espírito Santo	Paraibuna	SP
Fazenda Maria Andrade	Paraibuna	SP
Fazenda São Francisco	Paraibuna	SP
Sítio Caracol	Paraibuna	SP
Sítio JM	Paraibuna	SP
Sítio Camadam	Paulo de Faria	SP
Sítio Santos Reis	Paulo de Faria	SP
Fazenda Santa Clara	Pindamonhangaba	SP
Polo Reg. Do Vale do Paraíba	Pindamonhangaba	SP
Rancho Cafalloni	Pindamonhangaba	SP
Fazenda Santo Antônio	Porto Feliz	SP
Sítio 3 Ipês	Porto Feliz	SP
Fazenda Santa Isabel	Potirendaba	SP
Estância Espelho D'Água	Presidente Epitácio	SP
Estância Gegi - Lote 81	Presidente Epitácio	SP
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Sítio Duas Estrelas - Lote 62	Presidente Epitácio	SP
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Sítio São Gabriel Lote 12	Presidente Epitácio	SP
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Sítio Três Irmãos	Presidente Epitácio	SP
Sítio São José	Santa Branca	SP
Fazendas Diversas	Santa Rita do Passa Quatro	SP
Sítio Estância Colina	Santa Rita do Passa Quatro	SP
Sítio São Jorge	Sarapuá	SP
Fazenda Sobrama	Socorro	SP
Sítio São João	Taubaté	SP
Fazenda Boa Esperança	Vargem Grande do Sul	SP

Brazilian Association of Girolando Breeders

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Ricardo Miziara Jreige

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Dairy Cattle